NATURE MAGAZINE

May, 1946 35 Cents Vol. 39, No. 5

SEVENTY-TWO AMERICAN BIRD SONGS

ON PHONOGRAPH RECORDS

American Bird Songs

These Phonograph Bird Song Records are from the Laboratory of Ornithology, Cornell University. They were recorded in Native Wilds by the Albert R. Brand Bird Song Foundation.

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THE PROCESS OF RECORDING

These recordings were all made in the birds' natural haunts. The scientists used a sensitive microphone at the focal point of a three-foot parabolic sound-reflector which was aimed, like a gun, at the singing bird. The sound waves thus intercepted were transformed by the microphone into electrical impulses, much amplified in a sound-truck, and then used to vibrate a delicate galvanometer on which was fastened a tiny mirror. A slender beam of light shining on this vibrating mirror was deflected to a 16-millimeter film which passed from one magazine to another at a constant rate of speed. Thus the bird's song was photographed so that the image or sound-track developed on the film could be used in a reverse process and made to reproduce the song, which was then, in the laboratory, recorded on a phonograph disk.

The bird's song had to be amplified several thousand times. That means that extraneous sounds, such as wind in trees, running water, airplanes, farm machinery, and notes of other birds were amplified too. For that reason many promising attempts at recording proved failures. The songs here recorded represent the best results of many efforts.

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Birds of the Northwoods

No. 1 A	*No. 1 B*
1. Olivebacked Thrush	1. Scarlet Tanager
2. Veery	2. Rose-breasted Grosbeak
3. Wood Thrush	3. Slate-colored Junco
4. Hermit Thrush	4. Yellow-bellied Sapsucker
5. White-throated Sparrow	5. Alder Flycatcher
6. Whip-poor-will	6. Olive-sided Flycatcher

Birds of Fields and Prairies

No. 4 A	*No. 4 B*
1. Bobolink	1. Prairie Horned Lark
2. Meadowlark	2. Savannah Sparrow
3. Western Meadowlark	3. Lark Sparrow
4. Vesper Sparrow	4. Killdeer
5. Field Sparrow	5. Spotted Sandpiper
6. Red-winged Blackbird	6. Burrowing Owl

Birds of Northern Gardens and Shade Trees

No. 2 A	*No. 2 B*
1. Song Sparrow	1. Chickadee
2. Robin	2. Wood Pewee
3. Catbird	3. Chipping Sparrow
4. Baltimore Oriole	4. Red-eyed Vireo
5. Yellow Warbler	5. Yellow-throated Vireo
6. Flicker	6. Warbling Vireo

North American Game Birds

No. 5 A	*No. 5 B*
1. Ruffed Grouse	1. Gambel's Quail
2. Bob-white	2. California Quail
3. Wild Turkey	3. White-winged Dove
4. Dusky Grouse	4. Woodcock
5. Prairie Chicken	5. Canada Geese
6. Chachalaca	6. Mallard Duck

Birds of Southern Woods and Gardens

No. 3 A	*No. 3 B*
1. Indigo Bunting	1. Mockingbird
2. Pine-woods Sparrow	2. Brown Thrasher
3. Pine Warbler	3. Cardinal
4. Orchard Oriole	4. Summer Tanager
5. Yellow-breasted Chat	5. Chuck-will's-widow
6. Carolina Wren	6. Barred Owl

Birds of Western North America

No. 6 A	*No. 6 B*
1. Wren Tit	1. Lazuli Bunting
2. California Thrasher	2. Blue Grosbeak
3. Nuttall's Sparrow	3. California Shrike
4. Fox Sparrow	4. California Purple Finch
5. Western Tanager	5. Plumbeous Vireo
6. Black-headed Grosbeak	6. California Woodpecker

★

These Bird Songs are supplied as a service to amateur and professional naturalists. They make an ideal year-round gift and are a valuable addition to nature libraries.

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Recreation Publicity

The ABC's of Public Relations for Recreation. New York. 1946. National Recreation Association. 64 pages. 85 cents.

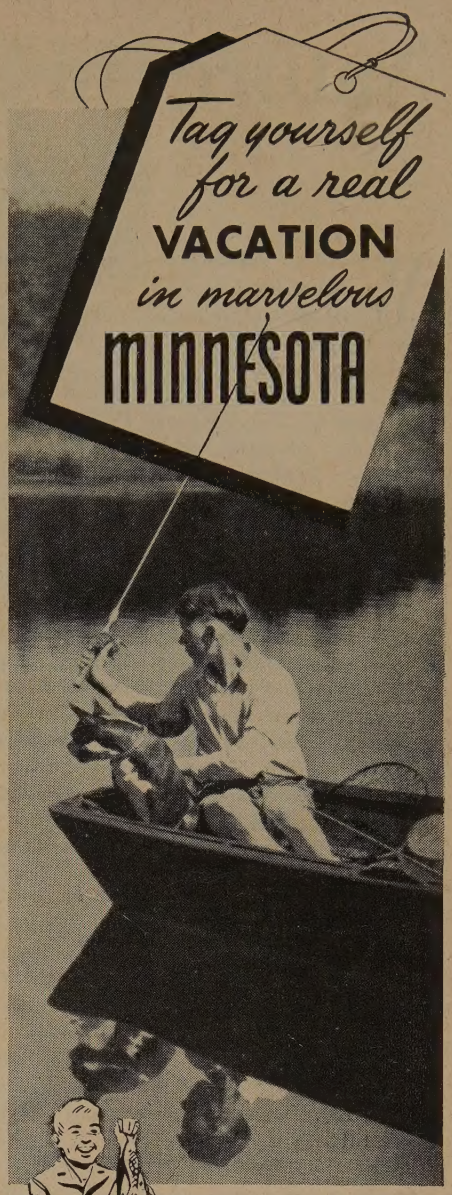
This little book carries the subtitle "A Primer for the Recreation Worker," and is designed to aid that worker in his relationships with the public, to instruct him how to obtain the cooperation of press and radio, and how to use other means of promoting the recreation idea.

Aid to Teachers

"Education in Conservation of Soil and Water" is the title of a helpful booklet containing a report of the Northern Great Plains Conservation Education Committee. The booklet is designed to be helpful to teachers in elementary and secondary schools, and at teacher-training institutions, in approaching the subject of conservation of soil and water. It is a result of discussions at a summer workshop in 1945 attended by educators and conservationists. Copies are available from Adrian C. Fox, P. O. Box 713, Lincoln 1, Nebraska, but limited supply requires that distribution be confined to educational administrators and those actively engaged in teaching conservation or planning to undertake it. Copies of the booklet will be supplied to these as long as they last.

Killing from the Air

"Sportsmen" and bounty seekers who have taken to the air in two-seater light airplanes to shoot foxes have been ordered prosecuted by the Indiana Department of Conservation. The state law prohibits and penalizes anyone attempting to kill or intentionally killing any bird or mammal from the vantage point of an airplane. Bounty seekers, however, found a profit in nose-diving on foxes, shooting them with shotguns and collecting them later for bounty.



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Nature in Print

By HOWARD ZAHNISER

WE WHO are interested primarily in the American outdoors have recently been enjoying the benefits of a number of series of books taking their central themes from geographic features. None of these seems to have been as appropriately handled from our point of view as the "American Mountain Series," edited by Roderick Peattie and published by The Vanguard Press.

The first of these series still current was that planned by Constance Lindsay Skinner to tell the folklore of the country under the general title "The Rivers of America." Some of the volumes have been in a very welcome way concerned with the natural scene, including the river itself, its plant life, and its wildlife. In the main, however, the "Rivers of America" volumes have been rather exclusively concerned with the central folklore theme (properly so, no doubt) and have been predominantly human and riparian rather than natural and riverine. (It has been some time now since the new volumes of this series have been submitted to *Nature Magazine* for review.) Somewhat similar have been the "American Folkways" series edited by Erskine Caldwell for Duell, Sloan & Pearce (including *Deep Delta Country* by Harnett T. Kane recently reviewed here), and the group of books including the lately reviewed *Call It North Country: The Story of Upper Michigan* by John Bartlow Martin published by Alfred A. Knopf under the general designation "The American Scene." "The American Lakes Series" edited by Milo M. Quaife for The Bobbs-Merrill Company has been much closer to the natural scenes from which the books have taken their titles, yet, with the exception of *Lake Superior* by Grace Lee Nute, these volumes also have come short of their possibilities for satisfying an interest in Nature as well in the human activities dependent on the natural resources.

"The American Mountain Series," however, now in its third volume, has demonstrated that a group of books can be appropriately designated by a geographic feature and then be so written and edited as to leave the reader with the satisfaction of having delved into physical geography with only proportionate concern with human geography. Both *The Friendly Mountains: Green, White and Adirondacks* and *The Great Smokies and The Blue Ridges: The Story of The Southern Appalachians,* each by a group of authors under Mr. Peattie's editorship, actually proved to be not only books in a mountain series but also books primarily about mountains! The latest publication in this group follows in their train.

The Rocky Mountains, by Wallace W. Atwood, differs from its two predecesors in having a single authorship. Under the title "A Preview of the Rockies," the editor contributes a delightful and informative introductory essay that it would be a privilege to quote in full, but all the rest of the book is the work of Dr. Atwood, the renowned geologist, who is President of Clark University and is described as "the foremost authority on the Rocky Mountains." Dr. Atwood says: "This is the first book I have ever prepared for the general reader." Rarely has such a work been so well prepared for lay reading, and one can appreciate what the author means when he expresses his debt to Roderick Peattie and the others in the publisher's editorial staff with the tributes: "I have never had more cordial assistance and I admire their patience." And one can in turn appreciate the satisfaction with which Roderick Peattie must have written this concluding (and well justified) paragraph for his introduction:

"Dr. Atwood has given us a rare combination of science and impression, the two wisely separated in chapters of their own—the scientific observation and the human reaction. Perhaps never before has the great book of earth fact, the story of the rocks, been so freely translated into the language of the layman. Never before has the life history of a mountain range been put on paper with such lucid simplicity. This volume is a milestone in the popularization of scientific fact."

Perhaps it is more to the point here to describe *The Rocky Mountains* as a third milestone in the popularization of American Nature in terms of a particular geographic feature. There is, nevertheless, no ignoring the effect these mountains have had on history. Dr. Atwood is well aware of the colorful human events that have occurred in the region of which he writes. He describes these under the headings "Bonanza in the Rockies", and "Indians, Ranchmen, Farmers, and Tourists." He even quotes in full four cowboy songs and in similar ways represents the folklore of the Rockies. Yet he finds Chapters 11 and 12 adequate for this purpose, in a book about mountains, and the reader coming to these chapters after first exploring the mountains and learning something of their emergence from the eternity of the past can enjoy them with what seems a proper perspective on the affairs of men. Dr. Atwood's sense of proportion seems much more influenced by his studies of mountain geology than by what he has heard and seen of the strange actions of men—a sense that leads him in one place to quote a sonnet with the concluding lines:

I love to leave my littleness behind,
In the low vale where little cares are great,
And in the mighty map of things to find
A sober measure of my scanty state,
Taught by the vastness of God's pictured plan
In the big world how small a thing is man.

As a matter of fact it takes Dr. Atwood only three paragraphs in his very first chapter to arrive at "some pinnacle or lofty summit" and quote this sonnet, the beginning of which we may as well admit also:

Why climb the mountains? I will tell thee why.
And, if my fancy jumps not with thy whim,
What marvel? There is scope beneath the sky
For things that creep, and fly, and walk, and swim.
I love the free breath of the broad-wing'd breeze,
I love the eye's free sweep from craggy rim,
I love the free bird, poised at lofty ease,
And the free torrent's far-upsounding hymn;

In this first chapter, entitled "Climbing to High Places," Dr. Atwood promptly brings the mountains to his readers and gives them a vantage point from which to experience the entire book. "Below us," he writes in its concluding paragraph, "lies the world of nature, and the struggle nature implies. Down in the valleys men plan and toil and concern themselves with insignificant scheme. For an hour we have been above the petty details of human existence."

In the second chapter the reader sets out on a geologist's field trip and in the following one begins to understand how "The Mountain Drama Unfolds." It is not until the fourth chapter—after the spirit of the mountains and of mountaineering has already been experienced—that matters of fact become predominant and the author writes:

"Remember that our mountain area extends from the semiarid portion of central New Mexico northward for at least 1000 miles, reaching into the well-watered and heavily forested lands of the Dominion of Canada. . . . In width, our region of study

varies up to 300 miles. We are dealing with about 300,000 square miles of country, all interesting for one reason or another, and containing many superb natural wonderlands."

There follow chapters called "Understanding Mountain Scenery," "The Art of Camping," "Mountains Are Worn Away," "A Day in the Wind River Mountains," "Mountains Rise Again," and "The Last Great Ice Age." Thus Dr. Atwood not only describes the Rocky Mountains and lends his readers some of his understanding of their formation; he also informs them on how to conduct themselves in the mountains as students, hikers, packers, and campers. And in his final chapter he describes (for both the United States and Canada) "The National Parks in the Rocky Mountains." We might have wished that he had also described as such the wilderness and wild areas of our National Forests and State areas (he does include the Denver Mountain Parks), for his concluding paragraph, describing so well the reason for national parks, fortunately does also explain the inclusion of such areas in any land classification that will preserve them. It is a paragraph well worth noting:

"The establishment of national parks in the wilderness areas of the world, or in the natural wonderlands and beauty spots, or where any unmarred bits of nature remain, provides cultural opportunities of inestimable value. The movement, which started in the United States, has spread throughout the Americas, and to a few of the older nations beyond the seas. With the great industrialization of modern life, with the mechanization and commercialization of farming and ranching, with the intensity that characterizes the work of many professional people, with the speed, hustle, and bustle of our everyday lives during most of the year, there should be some time and some place for real relaxation, for recreation, for rest, and for inspiration. The national parks offer all this to those who long to place themselves in sympathy with Nature."

Finally, as it should be, *The Rocky Mountains* is well illustrated—not only with photographs and with artistic sketches (by Eugene Kingman) but also with a very valuable folded, tipped-in relief map (by Dr. Erwin Raisz) and eight full-page drawings of cross-sections of the Rockies (prepared by Dr. Raisz in accordance with Dr. Atwood's field studies).

This is a book to be much enjoyed by readers everywhere and valued highly by any who plan to visit the Rockies. Furthermore, it is a volume well worth the study of any writers or publishers contemplating books on mountains, lakes, rivers, or any other geographic feature. Those who can improve upon it will do well indeed.

The Rocky Mountains, by Wallace W. Atwood. (Third volume in The American Mountain Series edited by Roderick Peattie.) New York: The Vanguard Press. 1945. 324 pp., with "preview" by Roderick Peattie, 33 photographs on 17 plates, 26 sketches by Eugene Kingman, 2 text maps of parks and connecting highways in the United States and Canada, tipped-in relief map by Edwin Raisz, 8 cross-section drawings based upon field studies by the author and prepared for reproduction by Erwin Raisz, geologic calendar for the Rocky Mountain region, bibliography, and index. $3.75.

On the Insect Menu

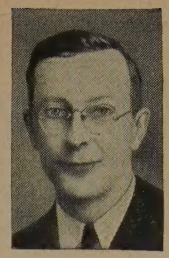
Insect Dietary. By Charles T. Brues. Cambridge, Massachusetts. 1946. Harvard University Press. 466 pages. $5.00.

Securing food is one of the three primary instincts that all animals share in common. More than any other form of animal life, insects, in the fulfillment of this urge, affect man's interests and become of economic significance. Also, insects, in their search for food, have guided their own evolution, and affected that of many plants and animals. Dr. Brues, Professor of Entomology at Harvard University, has, therefore, chosen the diets of insects as the starting point of his discussion, and has gathered between the covers of this book information nowhere else dealt with in any single work. While the volume is, of course, vitally important in the field of entomology, it is almost equally interesting to the layman. The student will find of great value the references and full bibliographies that follow each chapter. The layman will be largely content with the main text, which is surprisingly interesting reading. In this book we have a contribution to entomological literature that is outstanding in value. R. W. W.

Friendly Evergreens

The Friendly Evergreens. By L. L. Kumlien. Dundee, Illinois. 1946. D. Hill Nursery Company. 237 pages. Illustrated in color and black and white. $6.00.

Anyone interested in our coniferous trees, whether professionally, botanically or culturally, should have this fine book. Starting with a discussion of evergeens, the text considers them from many points of view—propagation, breeding, pruning, shipping, care, enemies, place in landscape design, as windbreaks, as hedges, as outdoor living rooms, and, even, poetically. The individual species are then discussed. In addition to a large number of practical illustrations there are many excellent black and white pictures and an unusually large number of colored pictures. The large size of the page permits effective display of the pictures, as does the excellent paper chosen for the book.



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More on Krakatoa

Editor, Nature Magazine:

Your story of the Krakatoa catastrophe recalls an incident during my high school days, either on the 28th or 29th of August, 1883. I was returning from school at Horb, in the Black Forest, to my home village. I dawdled along the road, and it might have been six p.m., time for the usual westerly sky panorama of sunset, which lasted an hour or more in our latitude. Two farmers came running from a hillside, as if under great stress. They happened to know me and shouted: "Run home, boy. Something terrible must be happening somewhere. May be a fire. Look over the top of that hill."

They pointed to the direct north, where the darkness usually started to creep over the sinking sun. While I was looking, an immense bank of cirrus clouds flowered over the entire northern sky, in colors varying from pale green to deep violet, and shot through with banks of bright red streaks. This lasted long after I got home, out of breath with running and excitement. A few villagers had joined my father—the village teacher—to ask about this terrible phenomenon. Dad assured them that it could not be a terrible conflagration because, although the wind was from the north, there was not a vestige of smoke. In fact, Dad thought that it might be the tail end of an unusually early aurora borealis. The sky remained vari-colored until almost dark. Father, being the "learned man of our village," immediately wrote an inquiry to the best newspaper in the province—at Stuttgart. He "compelled" me (although I was glad to do it as it made me important) to carry this inquiry back to the county seat to drop his letter into the mail car of a train that would reach Stuttgart early in the morning.

After two days he received an answer, also a copy of the newspaper in which several scientists opined that this was an aurora, but that others, telegraphing to Oslo, found that no aurora had been observed. Others thought that, somewhere in the far North, an earthquake, probably a sub-marine earth eruption, might have freed enough gases to affect the outer limits of our atmospheric hull. My father also thought this.

Then there was silence for at least three weeks. Then reports, mostly garbled, reached us. In 1883 there were no cables; no radios; in fact, no other communications with the eastern Pacific islands except the reports from ships landing at ports, whence information might reach London, which was the heart of all far-East communications.

For several weeks, except on rainy days, first the northern sky, then veering around the compass, these filmy messengers of a terrific phenomenon kept puzzling us. Finally reports drifted in, a year later, that certain parts of the globe were still witnessing faint discolorations where there should have been a clear sky and not a cloud to be seen. Scientists have since contended that the film-cloud in the stratosphere lasted for seven years. I have never been able to forget the awesome sky; or the frightened peasants, who feared the ending of the world on account of the wickedness of man; or my Dad's relief when he got the true story. At least he was as close to the real facts as many of the scientists who aired their views in the newspapers.

MAXWELL ZURNDORF

TARANTULA IN CAPTIVITY

By RALPH W. DEXTER

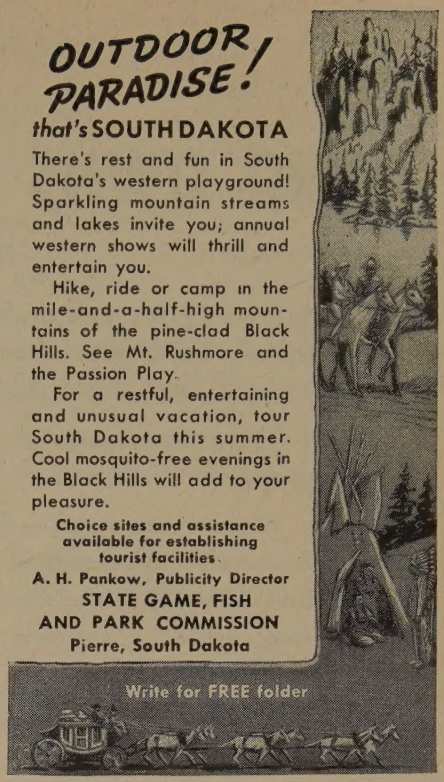
In the summer of 1941, a tarantula was captured on the Isle of Pines, south of Cuba, and sent to Kent State University in Ohio by Dr. J. B. Heath and Prof. W. D. Taylor. The tarantula, more popularly called the banana spider, was shipped in a tightly-closed pint jar and kept alive in a small terrarium for nearly two years. The body measured two and one-half inches long by seven-eights of an inch wide. It was fed on insects, chiefly houseflies and larvae of the mealworm, from which it sucked the body fluids. It was retiring in habit, burrowing and tunneling in the moist sand and gravel of the terrarium. When prevented from digging into the sediments, it remained crouched in a corner for much of the time. The addition of live food to the terrarium, or physical disturbance of the spider, brought it into activity. Three times it molted while in captivity. The first molt took place early in March, 1942. Nearly six months later it molted again during the last week of August. The third molt occurred at the end of April, 1943.

Following the casting of the old skin, the new coat was rich, glossy, reddish-brown clothed with sparkling golden hairs. With time the luster diminished. Gradually the spider became more and more dull in appearance. Repeated attempts to escape were made by pushing up the glass cover of the terrarium. Finally the tarantula succeeded in escaping during the night of August 6, 1943. A careful search failed to locate it. Several weeks later the dried-up carcass was found under a bookcase.

This is the poisonous spider often found in bunches of bananas when they are shipped to this country. Our specimen was identified as a member of the genus *Eusypelma* by Dr. Sarah Jones of the Texas State College for Women.

Illinois Parks

Anyone planning a trip to or through Illinois would do well to provide himself with a copy of "State Parks and Memorials," an attractive, illustrated booklet describing these reservations in Illinois. It appears to be available on request to the Department of Public Works and Buildings, State Capitol, Springfield, Ill.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Contents Noted

IF WE may judge by its publicity releases, the Railway Express Agency has been having quite a time with animal life of late, and some obstetrical problems. "Stinky," a mongrel with overtones of fox terrier, sweated out the Battle of the Bulge in the relative security of G.I. overcoat pockets, traveled widely from then on, but ran into restrictions at the Marseille docks. Her soldier buddies financed a trip home by express, destination Hayward, California. At Elko, Nevada, she upset the express car by becoming the mother of five puppies. A 200-pound, purebred sow, stopping over at Atlanta, Georgia, en route from Peoria, Illinois, to Salisbury, North Carolina, sent the expressmen scurrying for a veterinarian to aid her in producing five piglets. Goldie, a pet hen, spent two weeks in the "On Hand" department of the Railway Express Agency in Chicago, while the parents of her owner, nine-year-old Nydra, hunted for a house. Nydra dropped in now and then to take Goldie from her crate and play with her. We cite these incidents to prove that the express company is living up to the tradition immortalized by Ellis Parker Butler in *Pigs is Pigs.*

QUITE unintentionally we seem to have overlooked an important point in our recent article on the Chinaberry tree. A reader in Tennessee reports that local superstition has it that no ghost, spirit or "hant" will come about the premises on which one of these trees is planted. She reports that there seems to be no conclusive evidence of this protection, but adds that "the charm of this tree, the leaves, the lovely flowers and the truly divine odor of the blooms will certainly dispel the 'blue-devils.'" We have always wanted to make the acquaintance of a genuine "hant," so we have cut the Chinaberry off our landscaping list.

WHILE on the subject of the aftermath of articles we have published, we will report a number of reactions, pro and con, to the article "Moonstroke" in the February issue. A gentleman who has long studied and taught science, and served as president of the North Carolina Academy of Science, reports to W. L. McAtee, author of the article, a personal experience of forty years ago in India. He and a friend were going to a mountain resort from Rawal Pindi in the Punjab. The last part of the trip was made stretched out on the floor of a native cart. Our correspondent writes: "The moon was full in a cloudless sky. It shone directly on our unprotected heads most of the night as our cart toiled up the mountain. Next day my friend and I both had splitting headaches. My headache was such as I have never experienced before or since. Friends who were wise to India's moon had warned us, but we had not heeded. To be sure, our 'stroke' was not exactly the sort of which you are writing, but rather analogous to 'sunstroke.' And I cannot prove that my headache was due to the moon, but it is what we were warned would happen and we had no other possible explanation to offer."

DURING March, the Army Signal Corps, through the War Assets Corporation, undertook the task of returning some of its personnel to civilian life. These were trained homing pigeons that had been to war and honorably discharged with a "Certificate of Service." Four-H Club members, and other non-profit, educational groups, were offered these birds in pairs, in exchange for shipping crates and prepaid transportation charges. A friend of ours, as a boy, used to raise and train homing pigeons. On occasion the family became understandably anti-pigeon, and the young man offered the birds for sale. Shipped from Port Jervis, New York, to Brooklyn, New Jersey towns, and other not far distant spots, the birds were usually back in the home loft in a day or two. We wonder how many of these feathered GIs will turn up again at an Army Signal Corps depot all set to re-enlist?

JUST before this issue of Nature Magazine went to press up popped a proposal to cut timber within the boundaries of Olympic National Park. On the surface it seems to have been the bright idea of Federal officials struggling with the housing problem. The proposal is based on the currently popular plea —and subterfuge—that such invasion of the National Park is in the interests of the veteran. If we were to scratch beneath the surface we are certain that it would be found that idea started with lumbermen who eye the Park timber with envy. Of course, to achieve such a goal it would be necessary to have legislation passed removing from the Park the area involved. If selfish interests, parading as friends of the veterans, become that hold, we may be sure Congress will be deluged with protest. R. W. W.

Members of the woodpecker family employ their woodworking skill to provide homes of unusual strength and security for the young. Here a red-shafted flicker feeds a family that is safely housed within a nest in a pine stub.

Artifices of the Nest Builder

By JOHN LINDSEY BLACKFORD

Photographs by the Author

The cactus wren is a clever home-builder, and she must be, for she locates her tunnel-like nest amid the devilish spines of the cholla, a formidable cactus shunned by most other inhabitants of the desert.

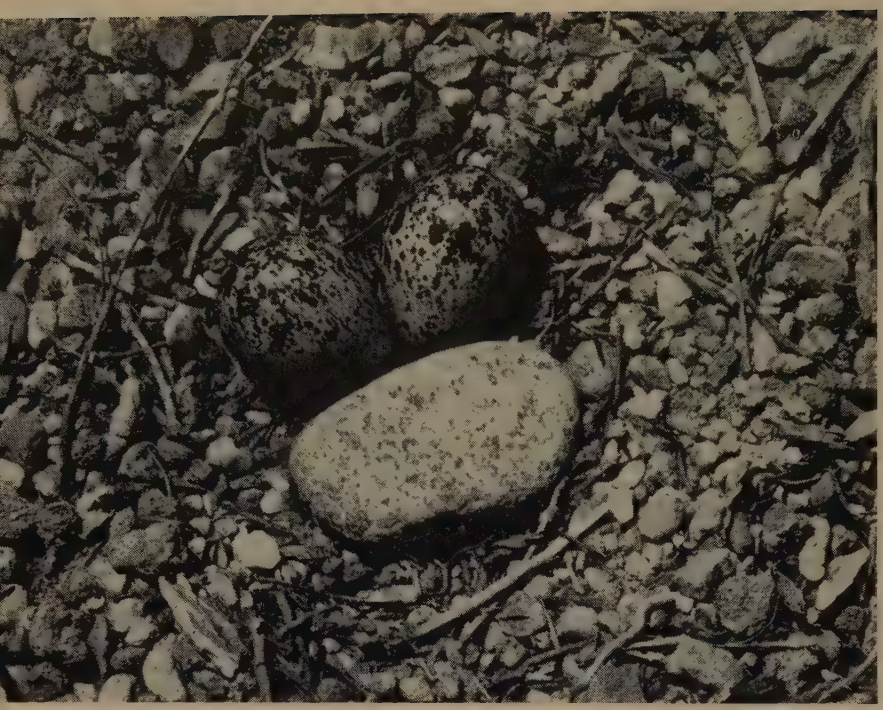
WHAT subtle discernment inspires an oriole to swing her dainty nest-hammock far out on the lacy tip of an elm bough? What instinct impels a red-cockaded woodpecker to drill numerous small resin wells about his nest hole in a living pine? The resultant flow of sticky sap may frustrate ant and squirrel enemies of the woodpecker household, yet few will say this is the knowing intent of the parent bird. The measure of conscious thought lying behind the oriole's nest-hanging—and similar stratagems—can only be surmised. But the artifices employed by feathered architects in safeguarding their homes remain a constant marvel.

Long before men resorted to caves, or built houses, wigwams or apartments, the birds had constructed for themselves numerous types of terrestrial abodes. Today they are not only expert in various styles of architecture, but facile and cunning in their concealment and protection. Many such ruses that bring nest and nestlings safely through the critical season are worthy of human ingenuity. They represent not merely unreasoning instinct, or fortuitous provision of Nature, but exercise of the bird's intelligence as well.

Artifices in nest building may have several goals, including dependence on wile or subterfuge; provision of safety through materials used; employment of camouflage; cooperation in nest construction or colonizing for mutual protection; and selection of nest site.

Any division must, in a measure, be an arbitrary one, for more than one aspect will likely be evident. Situation appears dominant in the case of the oriole's pendant nest, although her skill in weaving made possible its use. It is known that the eggs of our red-cockaded friends are never laid until the protective pitch pours freely from the punctures surrounding the nest hole. The efficacy of their defense may be credited to the peculiar material employed; but it is difficult not to attribute to these citizens of southern pinelands a truly knowing wile.

Leave it to the marsh wren, however, to cover the trail of its domestic activities. In the vicinity of its small hut—a coconut-shaped abode laced to the swaying blades of cattails or tules—the fidgety midget constructs half a dozen "cock nests." Would-be psychologists of the bird world disclaim that this implies any sly calculation on the part of the owner, ascribing the numerous nests to surplus of energy. But you and I may suspect something else. With so many door-



Nature carefully camouflages the eggs of shore birds, and the birds aid the deception by building almost no nest at all. In this killdeer nest the parent adds an extra touch with a little stone.

steps to watch, what chance has any harrier of the marsh of pouncing upon the mite as it slips forth into surrounding cover? Besides, a snake with an appetite for wrens for breakfast would probably wear all the scales from its urging belly long before discovery of the correct location of the real nursery.

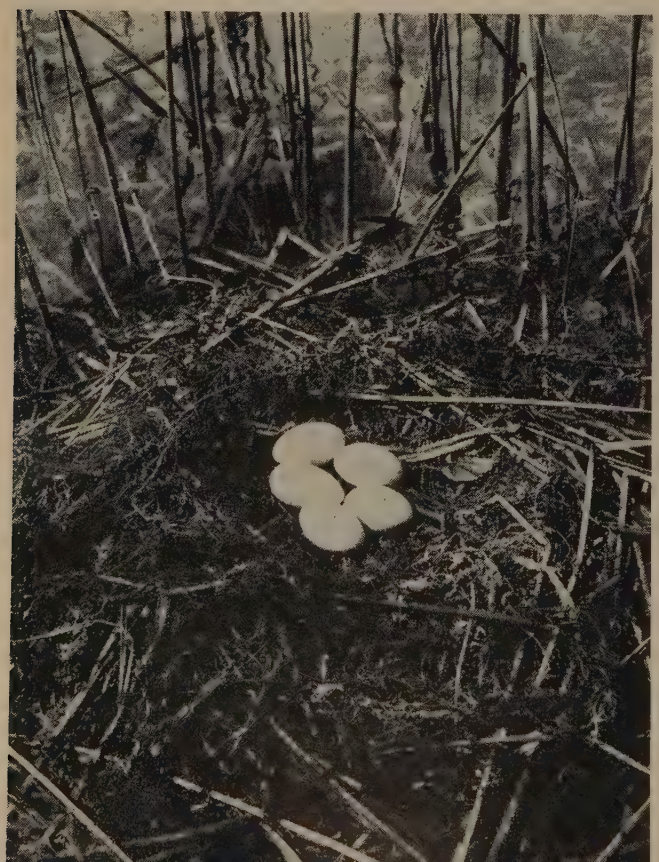
Both sides to the controversy, however, can safely agree as to the subtlety and super-energy of the marsh midget who constructed the dummy domicile pictured in the accompanying photograph. Among a dozen or so "false fronts," built by this reed wren in the immediate vicinity of its home, was this three-storied affair, guaranteed to keep any prowler guessing as to the correct address.

Other lands, too, boast clever home builders. In India and Ceylon the Baya sparrow hangs its curious house to a branch by a rope of fiber, and enters from below through a narrow tube. Both contrivances are wise and wily precautions where fanged and four-footed enemies abound.

The weaver birds are noted artificers of the great sub-continent. At nest hanging they outdo our orioles. A ballast of mud, moreover, is placed inside their long, woven pouch to keep it from swinging disastrously in the wind. Thus, by rare ingenuity, they forestall one of Nature's obscurer dangers.

It is hardly possible to return from house inspection abroad without mention of the celebrated nesting habits of the hornbill. In Malaya the tree hornbill makes use of mud, and in Borneo of a

Floating platforms of old marsh growth are built by grebes, and the result is a superb utilization of the protective conditions of the aquatic habitat of these birds.



A crowded tenement of the highly-social cliff swallows. These birds gain added security by colonization, and their dwellings on cliffs protect them from ground predators.

The barn swallow's nest is fashioned by the dextrous use of mud and straw. Before barns became common, the birds nested only on cliffs or in caves and still do so in the West and far North.

resinous gastric secretion, to conceal its domestic happiness. In either instance the male bird hopes to hide out his mate and their joint treasure by walling her up with the eggs inside some hollow tree trunk. A small aperture is left through which food is passed; and the cautious provider brings a specially-wrapped lunch at intervals two and three days apart.

Protective materials are artfully employed in nest building by many clever avians. The tiny, happy, golden verdin, living in the arid Southwest, rejoices in a dwelling with built-in defensive features. Interwoven thorny twigs of allthorn, cat's claw or mesquite compose the retort-shaped structure, which rests, unconcealed, at the end of a forbidding branch. Additional ingenuity is exhibited in the erection of a "porch roof" that slants down over the entrance, hiding it. The whole is a durable affair, entered through the smallest possible doorway, for it may become the verdin's winter lodge as well.

The bulky nest of Leconte's thrasher is armed with protecting thorns. Resting amidst mesquite or cactus, it safely cradles the nestlings entrusted to its care. Likewise few predators molest the young of the white-necked raven. This desert philosopher's rudely-bound framework of thorns is commonly perched in the bayonet-bladed crown of a tree yucca.

Mucilaginous secretions from salivary glands enable swifts to locate their nests in inaccessible places, while pellets of mud, gathered and cemented together, accomplish the same feat for other masons and nest architects of the interesting swallow tribe.

The marsh wren is a busy nest-builder, erecting several homes. Here is a three-story "dummy" nest that will keep prowlers wondering just what the bird's address is.

An osprey's air castle. On certain islands, where terrestrial enemies are few, ospreys may nest on the ground, indicating that high nests are designed for protection.

Camouflage is an ancient craft among nest builders. Hummingbirds ply the art with exquisite results. Their fairy cup, saddled on a slender bough, displays, when discovered, a fine filigree of lichens securely bound with silvery spider's nets—all to its nearly complete effacement.

The wood pewee adorns its small, felted bowl with lichens and cobwebs; so, too, the cerulean warbler, while the pine warbler prefers caterpillar silk. A plumbeous vireo's bassinet merges readily with its surroundings, being cunningly decorated with cocoons, insect webbing and plant blossoms. Living in the low scrub of semi-arid country, a gray vireo often hangs its grass-lined cradle with sagebrush leaves. The crested flycatcher's odd habit of encircling its nest with a cast-off serpent's skin is a camouflage twist that has created many a rift in ornithological ranks. Did the bird put it there to frighten enemies? Who, then, is daunted? Certainly not snakes themselves, or owls that relish them. Crows and jays are too perceiving to mistake a snake skin for the real article. Yet why else this almost universal custom?

On arid deserts nesting red-tailed hawks find the spiny column of the sahuaro a secure substitute for streamside or forest tree. This cactus shows flicker or woodpecker nest holes.

There can be little question of the results desired and obtained by the water ouzel. Its globular, moss-covered hut, freshened by the prismatic mist of a waterfall, is ever verdant like the green-felted rocks and boulders around about. And if not so conveniently irrigated, the dextrous dipper has been seen repeatedly to flip reviving moisture from its own slaty plumage upon the nest's moss-adorned walls.

In seeking disguise for a home what is more natural than that the creeper, modest caretaker of the tree trunks, should have found that the bark itself lends invisibility. This bird's nest is almost invariably hidden under the warp or curl of a loosened section. In the South many a banner of Spanish moss, bearding mysterious cypress swamps, timbered bottomlands and upland hammocks, conceals the home of a southern parula warbler. A simple nest-floor, built within the mass of a pendant streamer, sets a pair up to housekeeping. The limits of the Spanish moss country accurately define their breeding range.

Field dwellers, like the meadow larks, arch the surrounding grass stems to shield their lowly abodes. Tussocks and grass tufts, artfully taken advantage of, deceive countless hostile eyes. Juncos and sparrows know this camouflage trick well. Such rudimentary cover is the sole reliance of innumerable breeding waterfowl. The oven bird's nest on the forest floor is seldom discovered save by accidentally flushing his brooding mate. Cleverly screened with dead leaves, it almost defies detection.

Not a few species depend wholly upon natural disguise, dispensing entirely with nest accumulations. In this the shore birds are pre-eminent. The sand, shells and pebbles of the beach provide vast reaches where oyster catcher, plover and sandpiper, together with skimmer and tern, deposit their eggs and trust to Nature's concealing colors.

Safety in numbers is an axiom not lost upon feathered folk, and many are aware that cooperation in nest construction has its rewards. We are familiar with the gregarious habits of nesting martins, cliff and bank swallows, red-wings, herons, cormorants and others. Yet, among colonists, the social weavers of South Africa are unique. These friendly builders not only gather in the same vicinity, but construct a common roof for their dwellings. Working together in the branches of a giraffe thorn, they provide for themselves the typical shelter of inhabitants of the near tropics—a grass roof. Cartloads of the building material are used, and the communal, mushroom-shaped structure gives the impression of the tree having grown up through a native hut, lifting the roof with it. Individual nests are then hung in rows beneath. More than three hundred "rooms" have been counted in such an apartment house.

Other exponents of the united front in domestic matters are the brush turkeys of Australia, exotic birds that work together to accumulate heaps of decaying vegetation. Large communal mounds are thus built; and eggs deposited in the heat-generating mass hatch without benefit of brooding.

Finally we turn to those winged citizens who gain a measure of nest-security by the nature of the situation they select. The voluble cactus wren of southwestern desertlands makes use of a time-honored method of household "insurance." The spiny, protective maze of the treacherous (Continued on page 274)

Some of the herd of wild cattle that have made their home in Chillingham Wood, Northumberland, England, for at least six hundred years.

Wild Cattle of Britain

By E. R. YARHAM

AT CHILLINGHAM, Northumberland, is the most famous herd of wild cattle in Britain, dwelling in natural surrounding in wild, unspoiled parkland studded with trees. This herd has been there since the Middle Ages—for six hundred years, at least, since the park where they roam has been enclosed for that period.

The great interest these cattle have for the natural historian lies in the fact that some authorities have considered them to be direct descendants of the ancient aurochs. However, practically all who have studied the subject now believe that the cattle at Chillingham cannot be directly traced to the gigantic aurochs, but probably stem from some ancient breed that was formerly prized by owners of great estates, and which were given the run of their forests. There have been several herds on private estates in different parts of England, of which the Chillingham herd seems to be the last survivor.

The wild aurochs, exterminated centuries ago, is known throughout Britain from its fossil remains, and by the drawings of primitive man. It thrived contemporaneously with the mammoth, and was much larger than any cattle known today. Skulls and limb bones of specimens standing six feet in height at the shoulder have been found in the pleistocene gravels of the Thames Valley.

It is uncertain at what date the aurochs disappeared from Britain. In Scotland it lingered longer than in the south, while it was still abundant in Caesar's time in the Black Forest of Germany. As late as the twelfth century it still survived, and in remote areas undoubtedly lived on until comparatively recent times. It is thought to have survived in the Jaktozowka forest in Poland until 1627, and an account of it, with woodcuts, appeared in Freiherr von Herberstein's *Moscovia*, published at Venice in 1550.

This big-boned, long-horned animal is known as *Bos primigenius* by the scientists, and the Romans are said to have hunted it in Britain, although even before their time a smaller beast, the *Bos longifrons*, had been introduced. This was a useful domestic animal, and was soon widely distributed.

Neolithic man may have hunted and killed the aurochs for meat, and possibly some of the calves were captured and tamed. But with the introduction of the *Bos longifrons*, and the improvement of weapons, there was less room for the aurochs in the economy of man, and intensified slaughter resulted in the destruction of the herds.

The great park at Chillingham, with its area of about 700 acres, and surrounded by a wall, remains almost in its original condition of rough pasture and woodland. This hereditary haunt of the wild cattle was the last remaining fastness, it is said, when they entered it, of the primeval forest of northern England and Scotland. "The Great Wood" of Chillingham, as it was known, became the final retreat to which the beasts were driven by hunting and by increase of population.

Those at Chillingham may have formed part of the aboriginal herds that roamed the mighty Caledonian Forest, which covered much of Scotland. In the Great Wood of Chillingham the cattle were able to breed in comparative security until the park was enclosed, when they were preserved by the barons for the purposes of the chase. The herd is recognized as the best representative of white park cattle in Britain, and since Chillingham Wood was enclosed

The Chillingham bulls are notoriously short of temper, particularly those that have been deposed by a younger and stronger bull. Bewick, the famous engraver, was chased by a bull and sought refuge in a tree, and Landseer, the eminent painter of animals, was forced to seek safety in the thickets.

great pains have been taken to keep the breed pure. There seems little evidence of any admixture of other blood.

It is not surprising that the Chillingham beasts are extremely wild, and perhaps old Hector Boece, the fifteenth century Scottish historian, was not greatly exaggerating when he described them, after they had "run wild" for a thousand years, as "mair wild than ony uthir beistis." Although enclosed for so many centuries it is still not safe for any stranger to approach them. The only safe way to get near is to travel on one of the carts that are used in winter for taking hay to them. In summer the park supplies sufficient food.

They favor the bracken-clad slopes of the highest part of the park, hiding among the trees with the timidity and cunning of wild deer. All are shy and suspicious, viewing an approaching person with apprehension.

Both Bewick, the famous engraver—one of his finest blocks is "The Chillingham Bull"—and Landseer, the eminent painter of animals, were glad to escape from the attentions of the herd. When the former was making drawings the reigning bull of the herd gave chase, and the artist escaped only by climbing a tree. Landseer was tracked by some of the herd when making sketches for his pictures. He had to seek refuge in the thickets.

The cattle have habits peculiarly their own, some of which have undoubtedly come down from prehistoric times. The herd belongs to the Earl of Tankerville, and a former bailiff of the family, who knew them over a long period, and who was as familiar with their characteristics as anybody, describes some of them thus: "When the cows calve they hide their calves for a week or ten days in some sequestered situation and go and suckle them two or three times a day. If any person comes near the calves they clap their heads close to the ground and lie like a hare in form to hide themselves. . . .This is a proof of their native wildness. . . . When any one of the herd happens to be wounded, or grown weak and feeble through age or sickness, the rest of the herd set upon it and gore it to death."

Like nearly all wild animals moving in herds, the Chillingham cattle have a leader. The strongest bull always acts as king of the herd until displaced by a younger rival. Anyone going near the herd must be particularly careful to keep at a respectful distance from the outcast bulls. These are the ones that have been defeated by the master bull or "king bull", and driven out of the herd. This relegation does not seem to improve their tempers. When the cattle come down to the lower reaches of the park, at intervals, they move in single file, the bulls in the van. But, in retreat, the bulls bring up the rear.

Contrary to the generally held opinion about wild cattle, the Chillingham beasts are rather small, even stunted, by ordinary standards. They are a dirty, creamy-white color, with dull red ears and red hair about the muzzle. The somewhat short horns—longer in the older beasts—are upwardly directed and black-tipped. The original aurochs is thought to have been black in color, and the contrast with the Chillingham cattle is therefore great.

At one time the cattle are recorded to have had no red about them at all, and the prevalent white may have arisen from captivity and domestication, which frequently tend towards albinism. Still more powerfully influential may have been the owners' liking for white specimens, and artificial control of the herd resulting in the destruction of those of other hues.

The coats are rough and curly and the heads shaggy, and, despite their smallness, the cattle are impressive in appearance. Sir Walter Scott is said to have had them in mind when he wrote:

Fierce on the hunter's quiver'd hand
He rose, his eye of swarthy glow;
Spurns, with black hoofs and horns, the sand
And tosses high his mane of snow.

Certainly, even though comparatively small as compared with their huge, ancient relatives, when these beasts are aroused discretion is the better part of valor with any would-be intruder on their hereditary domains.

The theory that the Chillingham herd may be directly descended from the wild aurochs of pre-civilized times in Europe has been mentioned, and also that many disagree with this view. One of those disagreeing with the theory of aurochs' ancestry of the Chillingham herd was the eminent naturalist and geologist of the past century, Richard Lydekker. He declared that the contention that "the half-wild cattle of Chillingham are aboriginally wild animals may be confidently stated to be an erroneous idea, and, although they may have existed in their present condition for a very long period, it is practically certain that they are descended from a domesticated or semi-domesticated breed, possibly not very distantly removed from the wild aurochs."

Again, Professor McKenny Hughes published a study in which he endeavored to prove that the Chillingham cattle could not possibly be descended from the aurochs, which, he asserted, had "become extinct in Britain long before the Roman occupation." He held that they have come chiefly from cattle introduced by the Romans. In contrast to this theory, some natural historians believe that the aurochs may not have become wholly extinct in the wild north of England and Scotland until about the beginning of the Christian era. It is quite impossible to fix even an approximate date.

On the other side, the late Sir Harry Johnston, an eminent British administrator and African explorer, a man closely in touch with animals all his life, studied the problem of the Chillingham cattle, forming the opinion that they differ from the aurochs only by being smaller in size and shorter in the leg.

He summed up his view in these words: "The English wild cattle of today bear much the same resemblance to the urus as the pariah dog of the west of Ireland bears to the wolf, from which it is derived with scarcely any intermixture of other blood, and yet it is degenerate, differing from it only in size, with a bigger brain capacity and less bushiness of the tail."

Among British domestic breeds, the black, Pembroke type of cattle probably resembles the aurochs most closely. It has also been suggested that certain structural likenesses can be found in the skulls of some breeds, notably the Hereford, among the domestic cattle, and the Chillingham herd, among the wild ones.

The subject is a fascinating one, and whatever the descent of Chillingham beasts—the aurochs, or from cattle introduced by the Romans—they are certainly unique and worthy of preservation. In any case, they are easily the oldest strain in Britain.

For this reason it is fortunate that the herd has been saved for posterity. Owing to the burden of taxation, the Earl of Tankerville announced in 1939 that he was unable to maintain them any longer at his own expense. It was felt by those who know the cattle, and who care for the preservation of what little remains of the wildlife of ancient England, that the extinction of the Chillingham wild cattle would be a calamity. Once destroyed, they can never be replaced.

A public appeal was launched, and the "Chillingham Wild Cattle Association" was formed, members making an annual subscription to cover the expense of the herd's maintenance. Even now things are not easy, but during the past year or two the herd itself has flourished. It was down in numbers to only twenty-nine, but in three years recovered to almost its normal number of forty. Recently seven calves were born, an unusual number during recent times.

Trilliums

By MARGARET MITCHELL BERRYMAN

What miracle of white has Maytime wrought
In velvet on the hills that late were green?
What impious hand to earth has, ruthless, brought
From heaven's galaxy its damask sheen?
Do white-coiffed nuns pray here with downcast eyes,
Or fairies spread their linen on the grass?
Perhaps a thousand milky butterflies—
Pale tired vagrants—light before they pass.

There's sorcery here; white magic! All around
The glen is luminous as though the day
Had caught the moonlight, pinned it to the ground,
And held it shimmering there. Enchantress May,
A promise in her eyes, guile in her heart,
Has set her hostage trilliums on the hills,
And when her pledge to beauty she fulfills,
She beckons them and with her they depart.

Ah, June, disconsolate, blush to confess
You cannot match the May's white loveliness!

A Little Red School for Animals

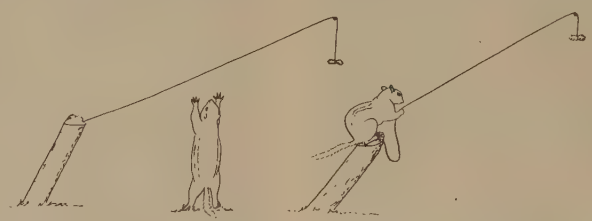
By KENNETH GORDON

THE LITTLE red school house is a familiar feature in various nostalgic accounts of our folkways. The imposing buildings of our city schools are our pride and joy.

In like fashion, the student of animal behavior has taken an equal pride in his colonies of white rats, guinea pigs, cats, monkeys, apes, and other more or less willing pupils. He has housed them in fancy cages; he has provided janitor service; he has watched their diets down to the latest vitamin. But he has neglected their country cousins. It is true that the student has sometimes captured these cousins and kept them in alien surroundings, and it is also true that often they have not proved to be impressive pupils. One might as well clap an honest citizen into jail for no good reason known to him, and then expect him to make a good record on intelligence tests compiled by some Eskimo savants. Nobody, so far as I knew, had ever taken the impedimenta of behavior studies, the mazes and the problem boxes, and used them on wild animals in no way confined and living their natural lives. Might it not be possible to do so, and set up a little red school house in the mountains or the desert?

How to get the peanut?

So, through parts of seven summers, and at as many camps in mountains and desert, I have conducted a series of experiments on the senses and learning ability of chipmunks and mantled ground squirrels. These animals are particularly favorable for such work. They are widely distributed in the western mountains, where they are common, diurnal in their activities, and readily become tame.



Peanuts were placed in a variety of positions to test the animals' ability to figure a way to procure them.

The routine at all the camps has been much the same. A place favorable to the animals and for photography is selected. Camp is established, and various foods are put out to attract the animals. They are caught in box traps and marked by dyeing the white stripes on their sides and by variously clipping the tail hairs. This is necessary to make sure of correctly identifying each individual animal. The particular experimental apparatus to be used is set up so as to accustom the animals to it. Sometimes a preliminary training period is involved. Then the experiment is carried out, recorded, and photographed.

It should be kept in mind that the animals are completely unconfined and busy with their normal activities; that they are subject to fleas, fighting, afternoon siestas, passing hawks or people, and all other distractions that wild animals have.

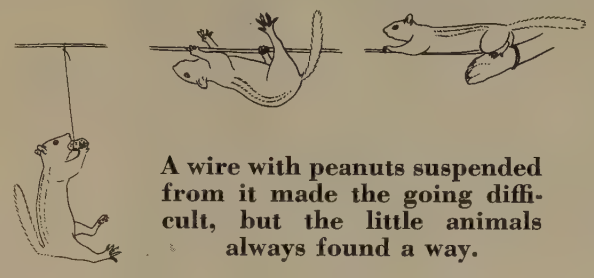
The earliest experiments—and some of the later ones—were made to test some of the animals' sensory reactions. One of these has a bearing on the way in which they find their food. Ordinary observation indicates that they are keen-eyed and far-sighted in the detection of possible enemies, the actions of their own kind, or intruders in their domain. One day I noticed a mantled ground squirrel trying to find his way down through the grass to the edge of the water on the far side of the stream by which we were camping. He gave up and crossed a small, log bridge nearby, hesitated to go out on some fresh, soft mud, but went around on a firmer surface, through some grass and out to the end of a half-submerged stick. Here he picked up an empty peanut hull that had drifted against the stick, handled it briefly, then dropped it and returned to the shore. There could be little doubt that he had seen the hull from the farther bank and came around to investigate it. And yet these animals, while quartering the ground in search of food, can pass by a nut that is only inches away, and never seem to notice it until they pass directly over it. At such close quarters smell and not sight is important in finding their food.

At one camp, peanuts were put on a hat brim until a certain ground squirrel came regularly to get them. Then a peanut was put in a large transparent gelatin capsule, so handled that no smell of peanuts would adhere to the capsule. After the other nuts were gone he nosed the capsule briefly, then ignored it. Another capsule containing a peanut was rolled in the hand among some peanuts to give it the appropriate smell. After the ground squirred got the other nuts put out this time, he promptly took the capsule, experiencing some difficulty in handling such a smooth object.

Most of the experiments, however, were made to test the learning ability of the animals in various situations. The first summer, when I was trying to discover the feasibility of conducting field experiments on behavior, I constructed a modified type of Carr maze. It is not a particularly effective type of maze, but it had the one virtue of not being too bulky, but, even so, the shades of the old mule pack-

ers must have marvelled at the impedimenta I packed away in one small roadster. There were two compartments in this device, a food chamber and the maze itself. A door led into the food compartment and another from it into the maze. The path through the maze was a tortuous one, about eleven feet long with nine blind alleys opening off the correct pathway. At the rear end of the box another door opened to the outside and freedom. The whole device was covered with coarse-meshed hardware cloth to keep the animals from climbing out. All the doors were operated by strings leading to the nearby car, where I could sit in lordly comfort and make my observations. This maze was used only with the chipmunks; a mantled ground squirrel inside was too much like a dog in a doll house.

When the desired chipmunk entered the food box the outer door was quietly closed. In its efforts to get out it would eventually enter the maze and then the door between the maze and the food chamber was closed. The first time a chipmunk was shut in the maze it was usually much disturbed, and spent much time going back and forth, in and out of the blind alleys, gnawing at the partitions and the wire covering, calling in alarm and sometimes crouching in an alley for minutes at a time. Some of the animals were too soon frightened away. But four of them learned to run the maze in not more than six trials. Chipmunk E made ten errors on the first two trials, and thereafter went through the maze at a steady gait without entering any blind alley or retracing any part of the path. Chipmunks E and J slipped a fast one over on me. It was my habit to close the outer door into the food chamber whenever I went away so that there would be no unobserved activity in the maze. Sometime during these absences the two chipmunks had learned to enter the rear exit to the maze and run clear through it to get to the food chamber. If they were disturbed they would run back through the maze to get out. And they were making no errors either going or coming.

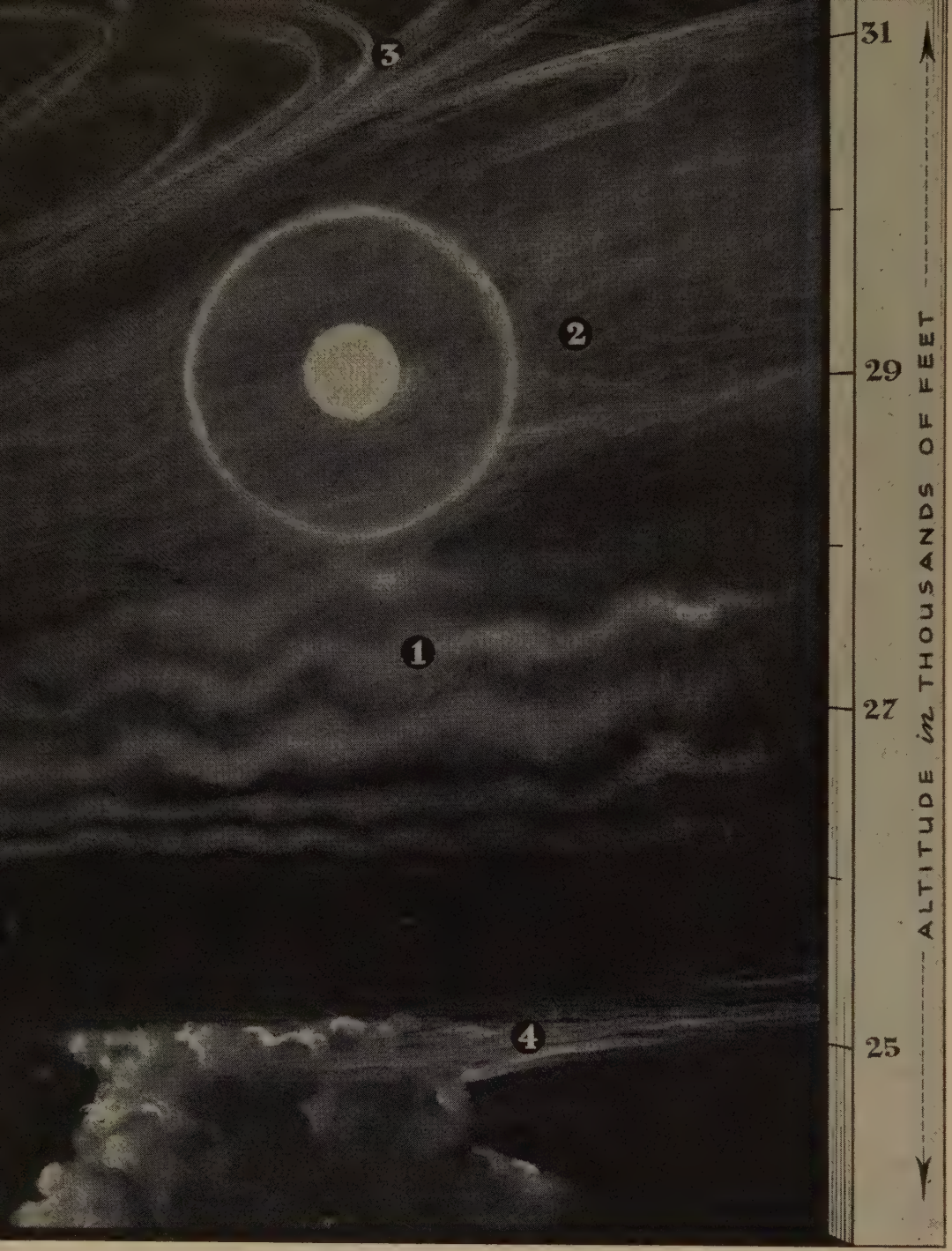


A wire with peanuts suspended from it made the going difficult, but the little animals always found a way.

At another camp a quite different type of maze was used. This was erected vertically to facilitate making movies of the experiments. It was made in four units with provision for two blind alleys in each unit. The whole maze, along with the basal food box, was about seven feet high. It was composed of a series of sixteen levels. Entrance to the first level was gained by climbing through a hole cut in the center of the floor. At either end of this level holes gave access to the next level, which in turn had a hole in the center. But on this level a partition was placed on one side or the other, just short of the center hole, so as to block access to it. This pattern was repeated through all the higher levels. Steady upward progress could be made by climbing through the center hole, then up through one of the holes at each end to the next level. If the choice were correct, the chipmunk could go on up through the next center hole on that level and face another alternative. If the choice were incorrect, it would find its way blocked by the partition and be forced to return to the lower level to continue its progress.

A long training period was involved in the use of this maze. Finally chipmunk number 11 was chosen because he gave promise of being the most faithful visitor to the maze. The first unit was set up with its two blind alleys in operation in order to accustom him to the general setup and operation of the doors into food box and maze. Then, in succession, two, three, and four units were set up with all alleys open in order to get the animal broken in to the long climb necessary to get out of the maze. Finally the partitions were put in place, creating eight blind alleys. Over a period of four days twenty trials were run and filmed. At first there was a good deal of retracing of the pathway. Sometimes the animal would work his way almost to the top and freedom, and then retrace his course clear to the lowest level, only to have to begin the long climb again. As the trials proceeded he cut down on the retracing, and would seldom drop down more than the one level necessary to get around a partition. In the final trials he would at times climb through the maze without entering any blind alley. Occasionally he would make the wrong choice, stick his head up through the end hole, sight the partition blocking the next level, drop down on all four feet and immediately run to the other end of the level and climb up through the proper hole. His slowest time for getting through the maze was 425 seconds on the fourth trial, and the shortest was 16 seconds on the nineteenth trial.

Another type of experimental device is the problem box. In the laboratory the animal is shut in the box and can get out by unfastening some kind of latch. In the field food was placed in a box until the animals grew accustomed to entering. Then a door with latches was made to block their access to the food. They very soon learned to pull unlatched doors open. In one of the devices a long latch was pivoted on a screw, which was just to one side of the door. The two animals used in this experiment tugged and bit at the door, but presently learned to push the latch up with their noses and then pull the door open. This latch was then blocked by a second one, which had to be pulled toward the animal before the first one could be nosed upward and clear of the door. There followed a great deal of pushing up on the first latch with the nose, and (Continued on page 274)



The Ice Clouds

By ERIC SLOANE

WINTER may give way to summer upon the earth, but a short distance upward winter is eternal. The high-altitude plane you see leaving its condensation streamer behind is flying through a strange heaven indeed. The temperature up there is capable of instant freeze; clothing has lost ability to keep the body warm, for heat is dissipated faster than the body can manufacture it. So electrically-heated suits and cabins are a necessity. The thin air, if breathed without mechanical pressure and oxygen, would not sustain consciousness for more than a few seconds; exposure to low temperature and low pressure at these heights can cause actual death in a very short time.

Even the cloudworld is different at such altitudes. All clouds from 27,000 feet upward are composed of ice particles. This is the world of cirroform, the ice clouds that hover clear to the ceiling of our troposphere, and scratch at the floor of the stratosphere. Well might one wonder how real ice sheets can possibly hang motionless in midair, but the housewife who has so often seen dust hovering in the sunlit air will answer that one. Dust is of earth, or even of heavy meteorite origin, and although a clod of earth will fall, dust particles are so small that the viscosity of air (which is a fluid) retards the fall. Slightly-ascending air will rise faster than the speed of fall of the dust, therefore it will appear to be rising through the sea of air when it is actually falling. Birds and gliders that appear to be rising (and actually *are* rising from the earth levels) are really falling through the rising air. The hovering cloud, too, whether it is composed of water or ice, is really falling through rising air.

Cirroform clouds have three anatomical structures as shown in the drawing. These are (1) cirrocumulus, or mackerel sky, looking like rippled sand; not to be confused with altocumulus, which is a pattern of lumps. Cirrocumulus is sure sign of approaching warm front, with rain about ten hours away. (2) Cirrostratus, like white cobwebs. When the sun or moon shine through this, a halo results. (3) Cirrus, the highest of weather's cloudforms, and often called mare's tails.

The artist will rarely attempt to paint the ice clouds, and the camera will (Continued on page 276)

The male barn swallow perched on the edge of his mud and straw nest. His white collar or ruff is plainly visible in the picture. At the right the mother swallow looks quizzically over her shoulder.

Barn Swallows as Tenants

By JULIAN BURROUGHS

WHITE'S *Selborne* is both an immortal Nature classic and a most delightful book to read. Written more than one hundred and fifty years ago, it finds, as time goes on, new readers in every generation. Written with no thought of publication, being a series of letters to friends who were fellow naturalists, its enduring charm lives, not only in its Nature observations, but in the sincerity, honesty, and humility of spirit of White himself. I am so fortunate as to have the copy that my father received in the autumn of 1875, and in which he made notes and comments. This is a quaint, little, blue-backed, gold-bound volume, published by Ticknor and Fields in 1866.

Since White had so much to say, and so many observations, about swallows and house martins, it was with both delight and anticipation that I observed, last summer, that a pair of barn swallows were investigating a building site in my shop. Never in all the years had barn swallows nested here at Riverby; therefore, I almost held my breath as they flew in and out of the loft, evidently trying to decide. One day I saw mud and grass stems on a slanting timber, and realized that their decision had been made. I was to be given the opportunity to study them; to compare my observations with White's; to learn to know them just as White had done so long ago.

The swallows had started their nest upon a sharply-slanting roof timber, thus, at first, the mud and nesting material they brought slid off. So, watching my chance, while they were away I quickly nailed a strip of wood on the lower edge of the timber to hold the nest and give them an absolutely safe foundation. Although very likely this was not really necessary, it was a pleasure to help the little swallows, if I could.

In speaking of this White says of the house martin: "As this bird often builds against a perpendicular wall without any projecting ledge under, it requires its utmost efforts to get the first foundation firmly fixed, so that it may safely carry the superstructure. On this occasion the bird not only clings with its claws, but partly supports itself by strongly inclining its tail against the wall, making that a fulcrum; and thus steadied, it works and plasters the material into the face of the brick or stone. But then, that this work may not, while it is soft and green, pull itself down by its own weight, the provident architect has prudence and forebearance enough not to advance her work too fast."

Reading this statement in *Selborne*, I felt both amusement and emotion, because father had made a mark, writing on the margin of the page: "Other birds do the same." So it is quite likely that my pair of swallows would have secured their nest anyway. Nevertheless, much of the material they brought at first, before I nailed on the cleat, did slide off.

White goes on to say that "careful workmen when they build mud walls (informed at first perhaps by this little bird) raise but a moderate layer at a time." I have known of masons who put up too much wall at a time, only to have it all fall down. In regard to this, and in commenting upon instinct as compared to reason, White says exactly what I have so often felt—that sometimes, under some conditions, instinct is wonderful and far superior to reason, while in other circumstances instinct can be utterly disastrous, reason being far superior.

The nest was rapidly built, the swallows using mud. White says of his swallows: "The crust or shell of this nest seems to be formed of such dirt or loam as

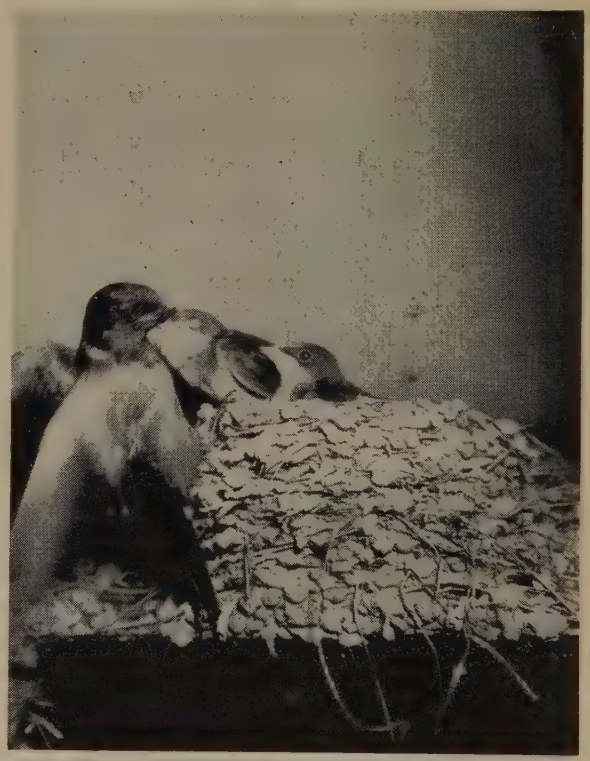
The father barn swallow arrives at the nest in response to the urgent request of a plainly hungry young swallow.

comes most readily to hand and is tempered and wrought together with little bits of broken straws to render it tough and tenacious." My swallows used heavy clay mud, with short grass and weed stems as a binder. As loam was not used, it is quite possible that in White's day the word loam had a wider application.

Barn swallows lay from three to six eggs, white, marked with speckles of Indian red and brown. Fearing to alarm them I did not climb up to look into the nest. Since there were three young, however, there must have been at least that many eggs. I did notice, from below, that the swallows used some white, fluffy chicken feathers for a coverlet to the nest, feathers they must have brought from a distance. Although I had red chickens just below the nest, the swallows evidently preferred white feathers, and were willing to fly far for them.

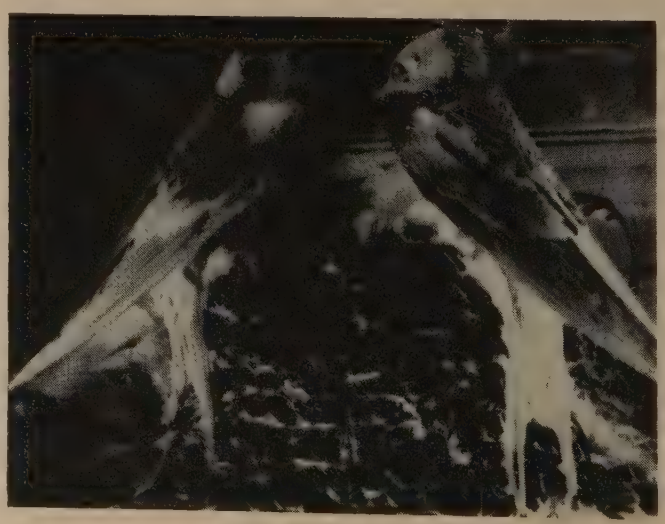
Tests with electrical apparatus prove that small birds do not hear the human voice, it being pitched too low for their ears. Nevertheless my swallows, the female at least, could easily hear me when I spoke. When I went through the room on the ground floor, I could look off through an opening in the ceiling to the nest, and although I could not see her on the nest, whenever I spoke to her softly, "Hello, sweetheart", the mother bird would at once raise up and look down at me. This happened so many times during incubation that there was absolutely no question but that she heard me. In answer to an inquiry concerning this, Professor A. A. Allen of Cornell said that in Nature, in the open or wild, it is impossible to tell just what birds do or do not hear, because the human voice may set up overtones. With this I certainly agree.

When the young were first hatched, both the parents spent much time at the nest, both hovering the young and feeding them frequently. They objected to my presence in the loft near the nest, fluttering rapidly about and uttering a sharp, scolding note. I noticed that father had the same experience with barn swallows in the barn at Woodchuck Lodge, and he translated this scolding note as "*Sleet*", "*Sleet.*" Even when I sat down in a far corner, remaining motionless, they saw me instantly. They were so unlike a wood thrush for instance, which will become tame with continued and careful treatment. The swallows remained both fearsome of the camera and annoyed by my presence to the very end of their housekeeping.



A camera speed of one two-hundredths of a second catches the male swallow feeding the young. Below, the two parents at the nest.

One cannot but admire White, he is so gentle and painstaking, so thoughtful in all his observations. A paragraph that especially impresses me, and one that father marked, concerned the feeding of the young swallows: "Not that Scopoli is so circumstantial and attentive to the life and conversation of his birds as I would wish: he advances some false facts; as when he says of the *Hirundo urbica* that it does not feed its young after it leaves the nest; '*pullos extra nidun non nutrit.*' This asser-



tion I know to be wrong from repeated observation this summer; (Sept. 14, 1770) for house martins do feed their young flying, though it must be acknowledged not so commonly as the house swallow; and the feat is done in so quick a manner as not to be perceptible to indifferent observers."

And all this is just what I found to be the case with my swallows. As the young grew and came near in development to the time when they would leave the nest, their parents fed them with incredible speed. Although I was entirely hidden in the room below, photographing by remote control, I had to keep my thumb on the flash switch to press it the instant I saw the flash of their wings. The slightest hesitation on my part and they were gone. An exposure of one-fiftieth of a second was just a blur. Even when I speeded the shutter up to one two-hundredths of a second, the picture showed movement. White was certainly an accurate observer.

Out of the dark and superstitious days of the beginning of natural history came the belief that swallow hibernated in the mud. Although I had always thought that Pliny said this, I find that, in *Riverby*, father quotes Dr. Johnson as saying that swallows sleep all winter in the bed of a river or pond, "conglobulated into a ball." So, even in White's day, this idea did persist, and he cannot rid himself of the idea that swallows do hibernate, somehow, somewhere. He says that, in early spring, he would notice a few swallows about. They would disappear again if the weather happened to turn cold and stormy, and he concluded that they had gone back to their place of hibernation. The editor finally grows out of patience with this, and makes a note that White had evidently argued himself into this belief.

In his *Midsummer Idyl* father has a word to say on the subject: "How curious that men should ever have got the notion that this airy, fairy creature, the playmate of the sunbeams, spends the winter hibernating in the mud of ponds and marshes, the bedfellow of newts and frogs and turtles!"

However, incredible as it may seem, the belief was widespread through all Nature writing—beginning with Pliny. In his book on ornithology, written nearly two thousand years ago, he says: "Swallows, the only flesh-eating birds among those that have not hooked talons, also migrate in the winter months, but they only retire to places near at hand, making for the sunny gulleys in the mountains and they have before now been found moulted and bare of feathers."

More than sixteen hundred years later Isaak Walton, in his *Compleat Angler*, has a word on the subject. On the authority of Francis Bacon, he says that swallows "live and sleep out the whole winter without meat in hollow trees." As though this were not enough he adds: "I think 'tis not to be doubted that swallows have been taught to carry letters betwixt two armies." Although he does later say that "swallows which are not seen to flie in England for six months of the year" do migrate to a hotter climate, many thousands staying behind to spend the winter in hollow trees. He compares them to eels, that live six months in the mud "without stirring up or down, and this the eel and swallow do as not being able to endure winter weather."

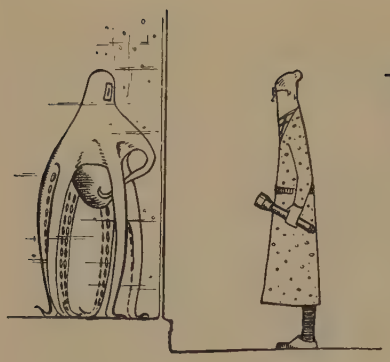
Emphatically on the other side, we have the word of New York's famous governor, DeWitt Clinton, who wrote, in 1822, that this idea that swallows spent the winter in the mud at the bottom of ponds and lakes was ridiculous—more, impossible! He wrote this after a trip on Cayuga Lake, where he saw thousands of swallows skimming over the water, publishing the fact in a travel book over the name of "Hivernicus."

Truly the swallow is one of our most beloved birds, known to the poets and sages and prophets of all peoples. They are children of the summer air, living on the wing, reaping an invisible harvest over the fields and pastures as though they dined on sunbeams. Just before they left for the South they came to revisit the nest in the loft, bringing their friends, fifteen or twenty of them. They flew happily about, twittering and dancing in the air, going in to the nest and out, the sun glinting on the bright steel-blue of their backs and wings. When they left, I knew that autumn was drawing near. But there is always the hope they will return as barn guests another year.

Wild Goose Plum Blossoms

By RUTH BRYANT SNEEDE

I think when Angels rolled the stone
Where Christ arose that Easter dawn,
In flying back to Heaven found
A wild goose falling to the ground;
And touching wounds in her limp wing
Transformed her to a bloom of Spring.
So now when bees begin to hum
Behold that cripple on the plum
With wings outspread both day and night,
And preening feathers bridal white!



What Fishes Do at Night

By WINIFRED DUNCAN

Illustrated by Lawrence D. Conway

AT TWELVE midnight I sat on a camp stool and looked at the octopus, and he looked at me. Lights had been out in the aquarium since sunset, and I was locked in there alone, armed only with my flashlight.

For some months I had been having deep thoughts about the great silent world of fish, living, day and night, in the shadow of the oceans. Would aquarium fish, I speculated, give any indication of what free fish do at night? They did. Ancestral habits seem not changed by a sheet of glass.

The flash of my light did not, I was relieved to find, disturb them. But it did disturb the octopus, and his malignant, milky-white eyes, with their oblong pupils, watched me coldly, while he went on with his night's work. Leaning on two of his eight elbows, he put one tentacle in his mouth and gazed over it, inflating his stomach in an insulting manner. When this did not dislodge me, he drew himself together with a shudder, rose up into the water on all eight legs, and turned a nasty, mottled white. After which he slowly raised one arm and inserted it into his stomach and left it there, like a murderer reaching for his weapon. This unnerved me. I looked modestly elsewhere to see what was taking place.

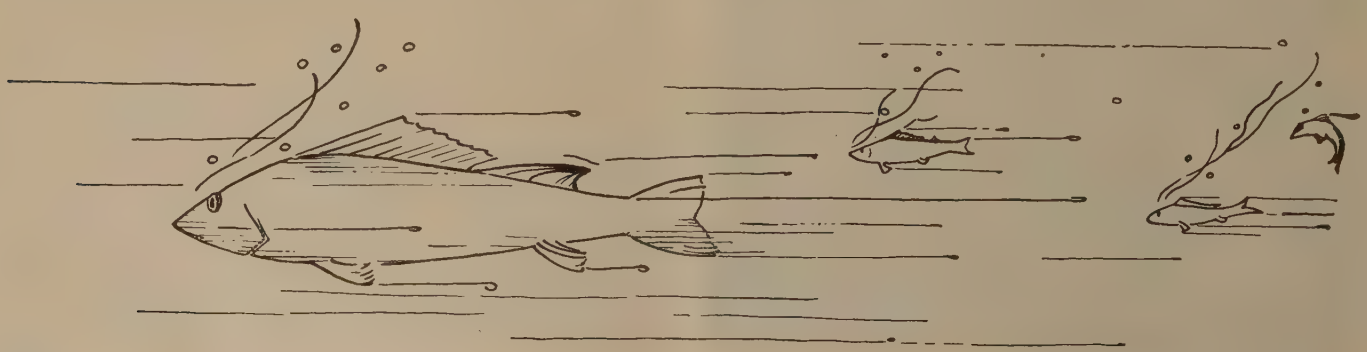
I had shared a common illusion that fish are creatures of perpetual motion and go on swimming, all night. I now discovered that I was wrong. They "go to bed" and sleep just like us. Opposite the octopus were five groupers and three rock fish. They had been motionless since ten o'clock. With fins tight closed, and resting on their stomachs, they were now perched in tiers on the rock ledges in their tank, leaning up against the rock wall. They were quite obviously asleep, with their eyes wide open. I sat still and thought about them. Tired, they were. But why?

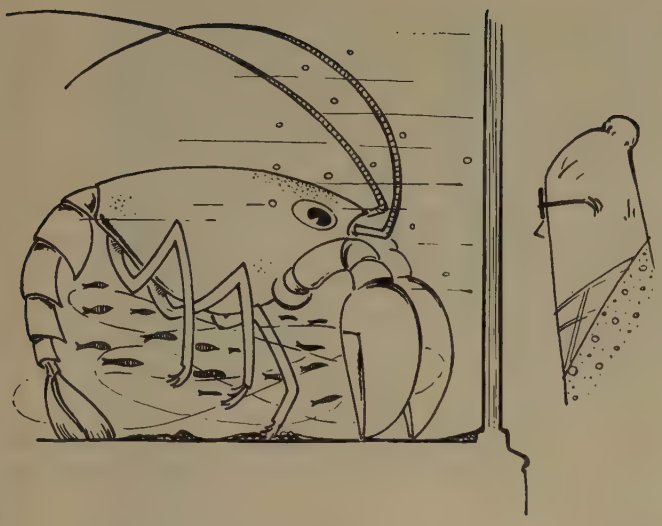
Well, for one thing, I remembered that William Beebe says, from the depths of his diving bell, that in the ocean there is a drift, governed by tides, and that all the sea things follow this drift. Anything cutting across this drift attracts their attention and upsets them. So I realized how annoyed I would be, if I were a fish, to find that in the tank there is no drift. Instead, a fish has to circle around dizzyingly, besides watching, all day long, human beings traveling right, left, in and out, in front of its window. Watching these humans is all there is to do; ignoring them would be to invite death by boredom. But it is exhausting—no wonder fish sleep. And, without eyelids they cannot close their eyes. Therefore they must view human antics, which they would be spared in their natural environment, and certainly suffer from eye-strain.

That is why, I deduced, all the fish in the tank to my left had stuck their heads into holes in the rocks, with only their tails sticking out—rows and rows of motionless tails.

However, only certain kinds did this. A general survey from tank to tank revealed that the great majority simply hung themselves up like laundry on every projecting sea-fan, coral branch, or sponge. Hooking their lateral fins onto a branch, they hung, tail up, head down, or horizontally, or at a jaunty angle of forty-five degrees. One thing they did *not* do, I observed, not one of them, was to keep afloat without some support. So swimming does, in the end, tire fishes and evidently they cannot float without some infinitesimal motion of tail or fin. I suspect there are exceptions to this, but there were none in that aquarium, which was one of the biggest and best stocked in the world.

I glanced back at the octopus to see if he had





stopped rummaging in his stomach. Yes, and he had turned a dark brown, had his back to me, and was inserting himself into a hole between two rocks.

As I moved my flashlight at random, its beam fell upon the tank where the great spiny lobster lived, and a fascinating sight met my eyes. With all ten legs spread, he was balancing on his tail and on his two swollen front claws, the body well-arched, feelers streaming up and over him, and was slowly rocking from side to side like a cradle. In the space under his legs and his body swam and floated some fifty little gray fishes, never budging for a moment outside those ten sheltering legs—a pretty sight. But suppose he should move? I tapped the glass sharply and flashed my light in the lobster's eyes. He backed off rapidly, and his fifty protégés backed with him, in exactly the same formation they had had before.

Next I concentrated on the flounder and the starfish, and found that their idea of a safe cat-nap is to nuzzle down flat into the sand and disappear. The flounder does this by oozing under gradually, rippling his wide, kite-shaped fins until their outline is lost. But he keeps one eye out and up. Raised conveniently on a tube, this eye swivels, this way and that, and looks like the blunt end of a thermometer. When he is sure all is well, he draws it in.

The starfish, having achieved the bottom, spits the sand out from under it, its tubed feet working like pistons. Then it lies flat and simply becomes invisible to the naked eye.

The octopus lured me back, and this time I caught him in the act of doing a skirt dance. Half in his hole and half out, with arms fully extended, he was rippling the skirts of skin that connect his tentacles, meanwhile changing from brown to mottled green to gray. He was, I gathered after a moment, practicing looking like a rock. As soon as he had got just the desired effect he stopped wiggling and backed into his hole again to see how well he matched—which was so well that had I taken my eyes off him for a single moment I would never have found him again. But the octopus had seen me, and putting out one tentacle he elongated it so that it looked like a snake with feet. This he pointed at me, menacingly.

I backed off and pretended to be looking at a large pink sea-anemone, which was groping vaguely into space with its pink arms. Slowly and delicately this creature turned a complete somersault. Attaching two of its tentacles to the rock beyond it, it carefully detaches its fat foot from the rock where it was moored, hoisted it up into the water, floated slowly over its two attached arms and came down, plump, on the other side. Getting a good grip on this new spot with its foot, the sea-anemone released the two arms and once more there was a flower-like aureole around the anemone's mouth parts. All this was done in slow motion. It took ten minutes by my wrist watch.

The next event in my nocturnal study was concerned with the shapes of fishes. After staring at them for several weeks I had noticed that fishes with slender, forked tails usually had high, pointed dorsal fins, broken up into sections, while fishes with thick, solid tails generally have one long dorsal fin, smooth, narrow and continuous along the whole length of the back. I decided that the fork-tailed, split-fin type were the swift swimmers that used their bodies for locomotion and the sharp fins for steering, like oar-blades. The long-finned, blunt-tailed type were slow swimmers with bulky bodies. They swam with their fins, with more haste but less speed.

There was another point I had been puzzling over for some time. The average slim, streamlined fish cannot see its food, because its eyes are planted flat along the sides of its head; and its nose is definitely in the way. As it cannot see its prey, except broadside, it really should have a mouth on each side and swim sideways. But it does not. After due investigation I found that such a fish swims up past the morsel, turns with lightning speed, and opens its mouth. And the living morsel seems to rush to meet its fate, and literally pops into the fish's mouth of its own accord. After spending several sleepless nights over this I discovered that the big fish simply opens its mouth to suck in water. The little fish gets caught in the suction and in it goes. So the big fish need not see its prey at all, except for one split second.

The octopus, during these reflections, had been

busy. With several of his arms wound around his body, like an old man hunched up, he was reaching out with two other arms, and groping about among the debris of clam shells, gravel and seaweed on the floor of the tank. With thoughtful precision he was sticking bits of shell, sand and weed on himself. By the time he had finished, and had drawn in his last arm, it was impossible to distinguish him from the green-gray, slime-encrusted rock about him. In the place where he had been, a white eye leered at me, once. Then it, too, closed and vanished.

It was 2 A.M. and nothing moved, any more, in the aquarium, except the spiny lobster, still swinging his ten knees first to the right, then to the left, with his kindergarten rocking between them. The anemone had drawn in her arms and become a pink blob. The little pudding wives, asleep on the sandy bottom, were heaped together, flat on their sides. In fours and fives they slept on top of each other, all headed one way, like gulls in the wind. The cow and the porcupine-fishes, goggling into space, with their chins propped on rocks, hung motionless behind. The wicked lampreys, with their heads floating straight up, gulped and belched water and swayed as they slept.

What did these silent beings around me see, feel and hear? I remembered the story a fisherman had once told me. He fished for trout on a little river near his house, and used, with great success and early in spring, a yellowish-gray artificial fly. This the trout took steadily for several weeks. Then all at once they ceased to rise to this bait. Why? He thought it out. The trees under which he sat to fish had been in bud. During a week of warm days, the buds opened into leaves. The shadow of these leaves upon the stream had altered the intensity of the sunlight. His artificial flies, which had been designed to gleam yellow in the sunlight, now gleamed yellow in the shade. And the fish knew that this was phony. He cast a gray fly. The trout rose. They knew the difference between a fly in shadow and a fly in sunlight. Did they see color, or merely a change in values?

Do fish hear? Science says no. Those in attendance at this aquarium thought differently, and had demonstrated it to me. The fish were fed at a regular hour in the afternoon. They knew this hour (therefore they must have a time sense) and grew as lively and restless as a lion at the Zoo.

At an hour when they did not expect to be fed and were swimming tranquilly, the feeder slipped around behind the tank, leaving me in front to watch. He walked along the alley way, as he does many times a day. The fishes gave no sign of hearing his footsteps. Then he rattled, once, the handle of the pail out of which he feeds them. The fish rose instantly, swam about in circles, looking up toward the light from whence the keeper's hand and arm should appear. This response to vibration, whether it hits a tympanum or a sensitized skin region, does not alter the evident fact that fishes respond to familiar sound.

Do fishes learn from experience? A very amusing experiment was made on this point. A fish tank full of water was divided down the center with a clear glass partition. On one side minnows were placed; on the other, perch, which prey upon minnows. The perch immediately went for the minnows, bumping their noses repeatedly against the glass partition, which, it is interesting to note, they could not see. After two days of this they gave up and nursed their noses. The observer waited two days more, then removed the glass partition. The perch, discovering, one by one, that there was no longer a barrier there, began to swim about among the minnows, but so thorough had been the lesson learned, the association of nose-bumping with minnows, that they did not chase them. The moment they came as close to a minnow as the thickness of the glass that had separated them before, they turned sharply away. "When this memory had gradually faded," said the observer, "they preyed upon the minnows as before."

I now meditated upon the interesting theory that animals do not have our color sense, but see ultra-violet rays. Again this gives food for thought. If the grouper sees a red rock as ultra-violet, why does his prey, the octopus, take the trouble to turn red when he settles on a red rock?

As I locked the aquarium doors, and groped my way sleepily over the moonlit coral rock, I remembered a long-forgotten song of my childhood—that childhood in which one *knew* and did not have to reason about the consciousness of fishes.

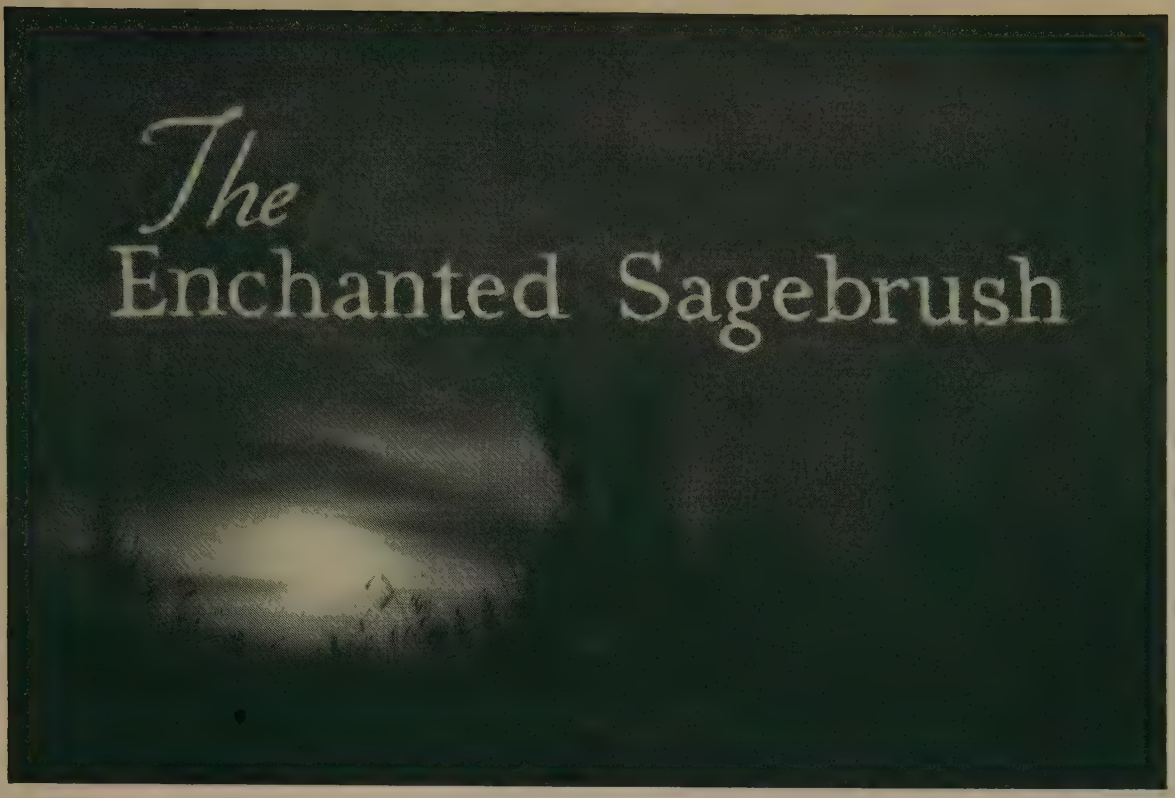
"Oh hush thee my baby, the night is behind us
And black are the billows that sparkled so green.
The moon o'er the combers looks downward to find us
Asleep in the hollows that rustle between.
Where billow meets billow, there soft is thy pillow,
Oh weary wee flipperling, curl at thine ease.
No storm shall awake thee, no shark overtake thee,
Asleep in the arms of the slow-swinging seas."

Pluvial Praise

By OREN ROOT BROWN

"April showers bring May flowers,"
Is good prophecy, I'll grant;
But why not sing of summer rains
That save the things we plant.

The Enchanted Sagebrush



A Story in Pictures by George Elwood Jenks

IDLE lands, wastelands, weedlands—this is the world of the enchanted sagebrush. It is a world that contains mysterious miniature worlds of its own, all teeming with strange and fantastic life. The enchanted sagebrush is the dwelling place of some of the oddest and most fascinating creatures in all Insectland.

In *Nature Magazine* for June, 1940, there was unfolded the life story of the "Dwarfs that Live in Their Hats." And, during the years that have intervened, I have found many other strange "beasts" living upon the same host plant as these strange little "hat-dwellers." This plant is *Artemisia californica.* It is not the sage that is used by cooks for seasoning, but it seems to be a favorite "dish" for the motley crew that find food and lodging in its juicy green foliage.

So we will take our magic glass and delve still more deeply into this usually unobserved world. Look! What is going on here? Of course it could not be, but it looks like an insect masquerade party, with the bugs trying to impersonate human beings. Let us take a close look.

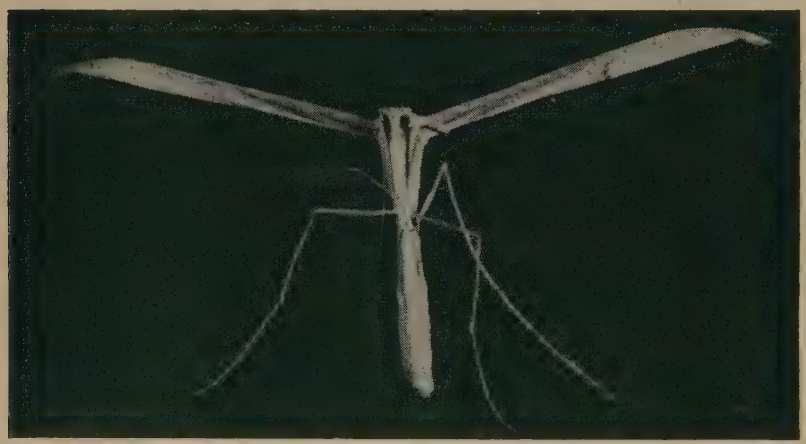
Is this be-jewelled creature the Queen of the Ball? Or, perhaps, she is a guest star from the movies. She has just dined upon synthetic nectar of honey and water in a pellet of cotton. This is an insect cocktail that is quite harmless when it is fresh, but which develops a "kick" if it stands too long. She seems a bit under the influence as she pats her scintillating head-dress. Anyway . . .

. . . something seems to "send her", in the language of the modern dancer, into some strangely human antics that end in this wild, "hep-cat" climax. According to Dr. J. A. G. Rehn, specialist in orthoptera at the Philadelphia Academy of Natural Sciences, this "strange looking beast . . . is the immature stage of one of our species of oval winged katydids of the genus *Scudderia*, and, as you will note, bears little resemblance to the adult." But . . .

. . . perhaps an appropriate partner for this Queen of the Masquers would be this odd and arrogant "zoot-suiter", which finds its home in the nectar-laden wild anise that grows next door to the sagebrush. This is a tiny Chalcid, less that half an inch in length, and it is identified by C. F. W. Muesebeck, entomologist of the U. S. Department of Agriculture, as *Metadontia amoena.* It is a parasite of small butterflies.

In all such gatherings on the sagebrush there seems to be a sprinkling of "snooty" bugs. This one marches along the silvery bough of the sage with an awkward gait that is reminiscent of the once proud and arrogant goose-steppers. But . . .

. . . this cocky insect at the left had better watch out because this is what his snooty beak will look like when he grows up. This dweller of the sage is *Scolops* and belongs to the old family Fulgoridae, which includes some species that live in tropic climes.



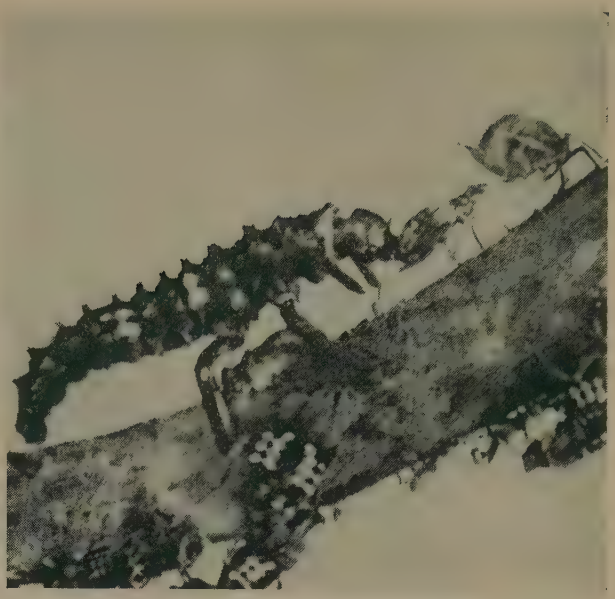
A hasty glance at this plume moth at rest seems to indicate that the sagebrush world also has its airplanes and that the sage is a landing field. This one looks like the wooden toy airplanes that youngsters sail through the air. Could it be that it is made out of lumber that comes from . . .

. . . the "wooden worms"? No, this brown looper caterpillar would not saw up, even into tiny boards. But its skin looks exactly like the bark of a twig, even to having imitation buds, as found here on the sage.

But what is this fearsome creature among the lower branches of the sagebrush? Is it a miniature dinosaur, or an armored ogre spying on some insect party? No, it is only the immature form of a harmless cicada that has come up out of the ground below.

This is a real wolf in sheep's clothing, a ladybird beetle larva hidden beneath a woolly overcoat. The "wool" that covers this enemy of the aphids is composed of hair-like filaments of white wax. But . . .

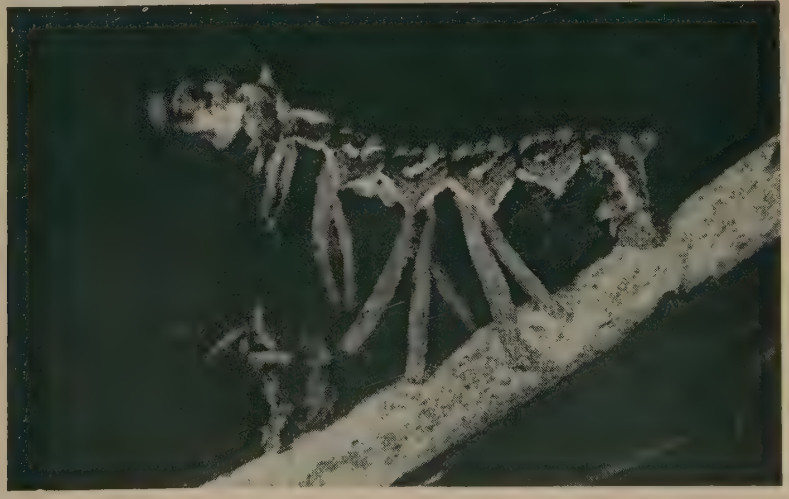
. . . it is only when the larva molts that we glimpse what the insect really looks like. It is a brief view because the larva is exuding a new coat of "wool."



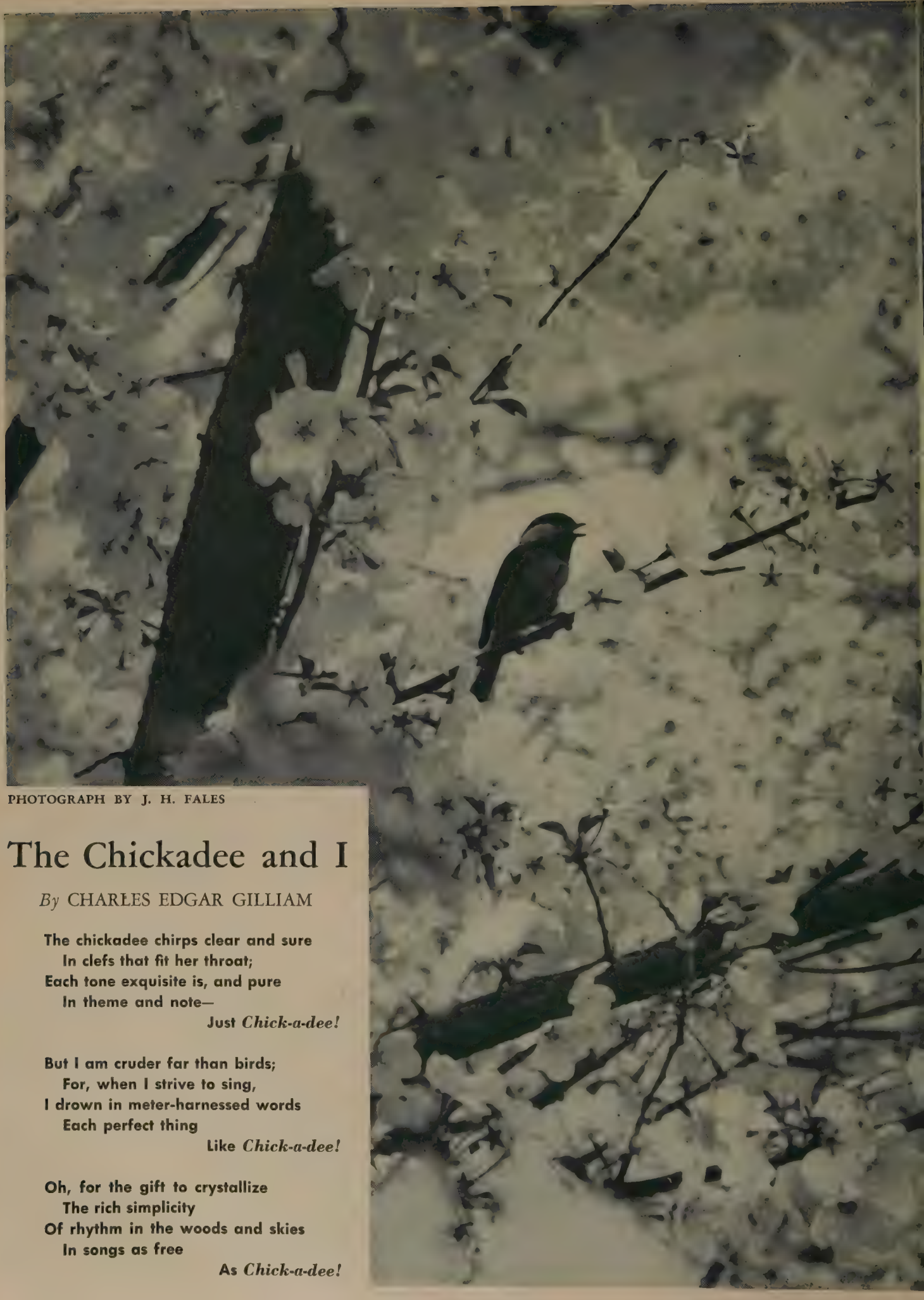
There is nothing lamb-like about *this* ferocious, aphid-devouring dragon. It is the larva of the convergent ladybird beetle, and is said to devour about fifty aphids a day. Such creatures are probably not invited guests to the insect party, but they are found on the sage foliage.

When the party is over, perhaps some of the jitterbug masquers will ride home in this double-ender, streamlined "bus". Probably you will have to look twice before you can tell which way it is headed. In the daytime it appears to be quite harmless, but . . .

. . . in the "dark of the moon" it looks like a terrifying goblin. I have found only one of these creatures in the world of the enchanted sage. It is a froghopper known as *Clastoptera lineatocollis.*



If the insects gave a prize for the most grotesque costume, this insect would be a winner. Surely her own mother could hardly recognize her in this disguise. Yet it is a live, unposed insect in its natural sagebrush habitat. It is the caterpillar of the moth, *Nemoria californica*, a Sagebrush Cinderella. The story of its life, and the reason for the strange costume it wears here, is a fascinating one. It will be told in picture and story in a later issue of *Nature Magazine.*



PHOTOGRAPH BY J. H. FALES

The Chickadee and I

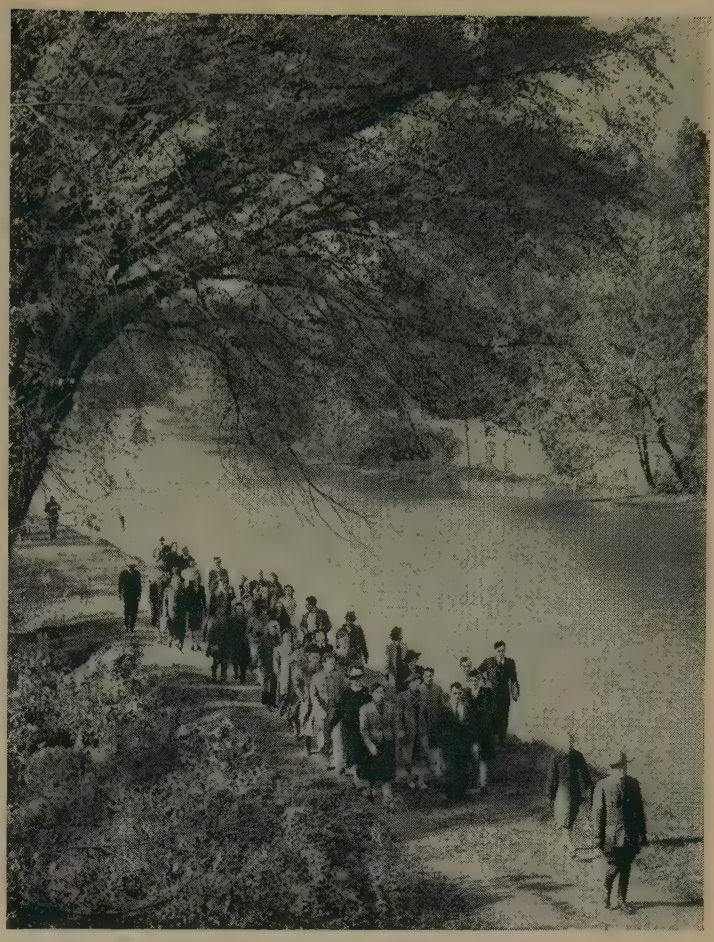
By CHARLES EDGAR GILLIAM

The chickadee chirps clear and sure
  In clefs that fit her throat;
Each tone exquisite is, and pure
  In theme and note—
    Just *Chick-a-dee!*

But I am cruder far than birds;
  For, when I strive to sing,
I drown in meter-harnessed words
  Each perfect thing
    Like *Chick-a-dee!*

Oh, for the gift to crystallize
  The rich simplicity
Of rhythm in the woods and skies
  In songs as free
    As *Chick-a-dee!*

Residents and visitors to the Nation's Capital join in a walk to observe the trees in the Capitol grounds under the leadership of a naturalist of the National Park Service.



Park Naturalist Donald Edward McHenry, chief naturalist of National Capital Parks, takes a group of Nature hikers along the bank of the old Chesapeake and Ohio Canal.

Washington Takes to the Woods

By MILDRED J. ERICSON

Photographs Courtesy of the National Park Service

WITHIN the shadow of the Nation's Capitol, foreign diplomats, scientists, visitors, government clerks and executives have adventured with birds, wild flowers, trees, mammals, rocks, and fossils in exploring trips under the leadership of naturalists of the National Park Service.

Thousands of visitors to the great western national parks, like Yellowstone, Grand Canyon, Yosemite, and Glacier, have trailed behind the green-clad ranger-naturalists, listening to them unfold countless interesting facts about the wildlife, plants, and rock formations along the trails. Most people think of these government naturalists as part of the mountains and forests, and they are surprised to see them in the "merry-go-round" city of Washington, D. C. However, a naturalist staff is there, busy as ever.

Is there a demand for such Nature outings in the "cultural city of the world" where there are so many other events to attend? Indeed there is. Many thousand participants enjoy the outdoor program.

From dawn to dark every weekend, beginning in April and extending through October, finds Washingtonians deriving pleasure from the naturalist activities in the National Capital Parks. This year is the tenth anniversary of the launching of the Nature program in the Capital City. Its success is evidenced by the attendance of more than 2,000,000 in this 10-year period.

Early morning bird walks are scheduled each Sunday morning at six o'clock in the various parks during the spring and fall months. As many as two hundred people have appeared at one time to go bird spying at an early hour of the only morning government workers had the chance to sleep! Three hundred and twenty birds are reported for the Washington area, so each trip offers its reward of bright-colored feathered songsters. The next Sunday is sure to see many of the same bird observers back on the trail again.

Sunday afternoons there are both "Nature walks" and "Nature hikes" scheduled on the outdoor program. As Park Naturalist Donald Edward McHenry explains, the "Nature walks" are "less walk and more talk," while the "Nature hikes" are "more walk and less talk." The Nature walks are usually two hours long, while the hikes, approximately five miles, are usually of three hours' duration.

The naturalists are not satisfied just to guide explorers on a "Nature hike." Through the newspapers the public is invited to attend a "frog and salamander walk," a "walk to explore for bird nests," or a

"walk to learn about insect pests," just to mention a few. Do not think, though, that you will necessarily be lucky enough to catch a salamander, even though you spy one and follow its merry chase over rocks and fallen logs. When you think you have captured one you may come up with just a wiggling tail! Salamanders, the hikers discovered, protect themselves by dropping their long tails at will, and then racing to freedom.

Some Washingtonians may prefer not to hike on Sundays. If so, they may take a "nineteenth century joyride" on the old, historic Chesapeake and Ohio Canal barge, traveling at the "tremendous" speed of two and one-half miles an hour! The "Canal Clipper," accommodating sixty-six passengers, is pulled by a mule, as in the days of old when barge travel was a chief means of transportation. The "clipper" passes through hand-operated locks. On the shore near the locks passengers see the old, quaint homes of the lock-keepers.

A naturalist or historian accompanies each barge trip and presents a historical account of the old canal. He also points out the trees, shrubs, rocks, and birds that are seen along this interesting, out-dated waterway. Old pictures of the canal and its early boats, and cellophane-enclosed pressed plants found along the canal's banks, are passed out for inspection by the sightseers. Because of the specimens and collections carried, Naturalist McHenry has another name for the "Canal Clipper"; he calls it a "mule-drawn museum."

Last year 5569 individuals spent "gasless" Sundays behind a hay-propelled motor, a mule, on the old canal, which was inspired by George Washington's original plans for using the Potomac River as a waterway.

Every Saturday evening at eight outdoor enthusiasts gather around a blazing campfire to listen to good music, and to see colored movies and Kodachrome slides and hear talks by world-famous scientists on a variety of subjects. These range from "China's Far West" to the "Private Lives of the Insects." These glorious outdoor campfire programs are scheduled from June to September. An attendance of 1500 is not uncommon at these popular events.

At the top of the page Nature hikers pause i their walk along the towpath of the Chesapeak and Ohio Canal to investigate something dis covered by the naturalist. Two Waves make th acquaintance of Nature's original armored tank And a harmless snake is discovered along th way and introduced to the members of the party

A barge, the *Canal Clipper*, provides Washingtonians, each weekend, with trips on the famous Chesapeake and Ohio Canal at the break-neck speed of two and one-half miles an hour. Below, the campfire program that celebrated the twenty-fifth anniversary of the National Park Service. Such campfires are held from June to September, and an attendance of fifteen-hundred people is an average turnout.

Also scheduled each weekend are historical tours through some of our Nation's most famous shrines, and camera strolls. Several star-study outings are planned during the course of the summer. Before the war, all-day auto caravans and geology trips attracted thousands of participants. Even weekend trips to Williamsburg, Yorktown, Jamestown, and the Great Smoky Mountains National Park have been taken.

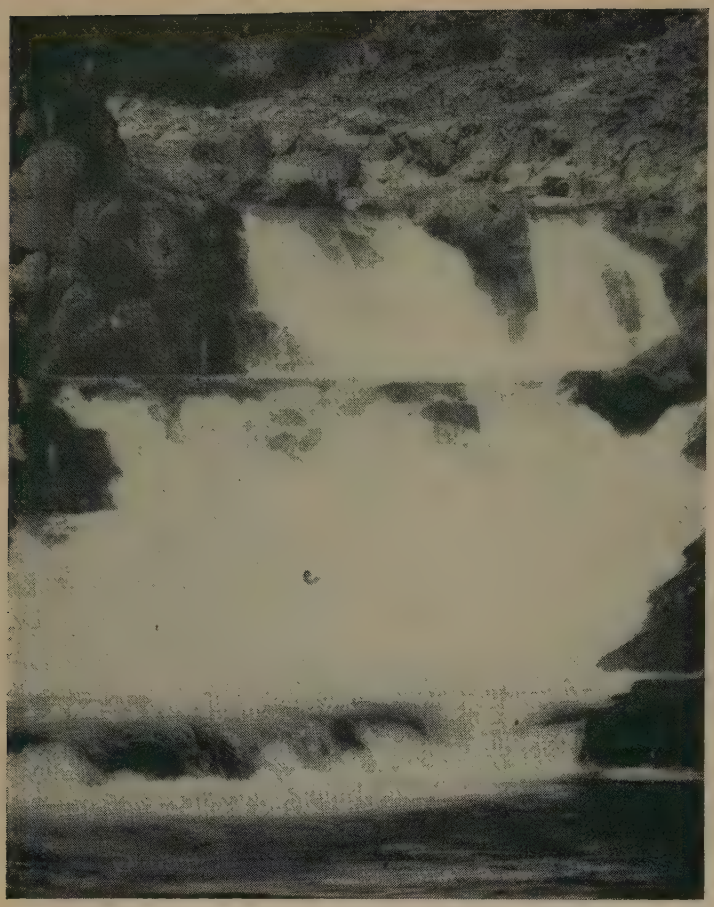
For children there are special weekly junior Nature outings. A naturalist also meets with the various day camps held throughout the city by the District of Columbia Recreation Department, and other groups.

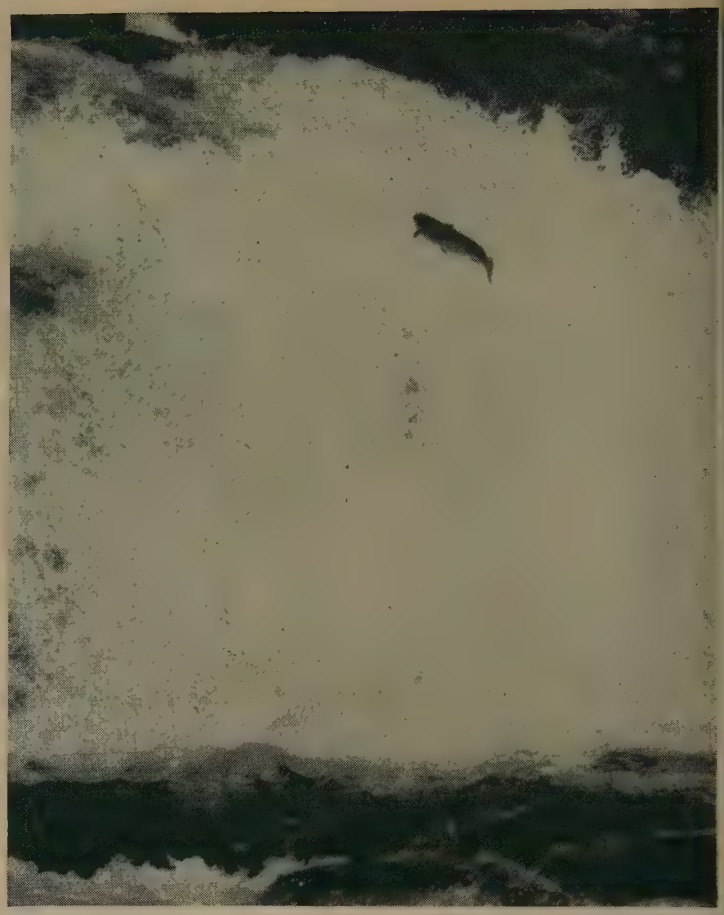
There was such a demand for even additional knowledge about the outdoors that, by popular request, a Nature leadership training course was established. It meets for six weeks each spring with a full schedule of bird walks, field trips, lectures, and laboratory work. A few of these leaders, as well as Audubon Society members, and some of Washington's foremost scientists, volunteer their services in conducting some of the bird and Nature walks.

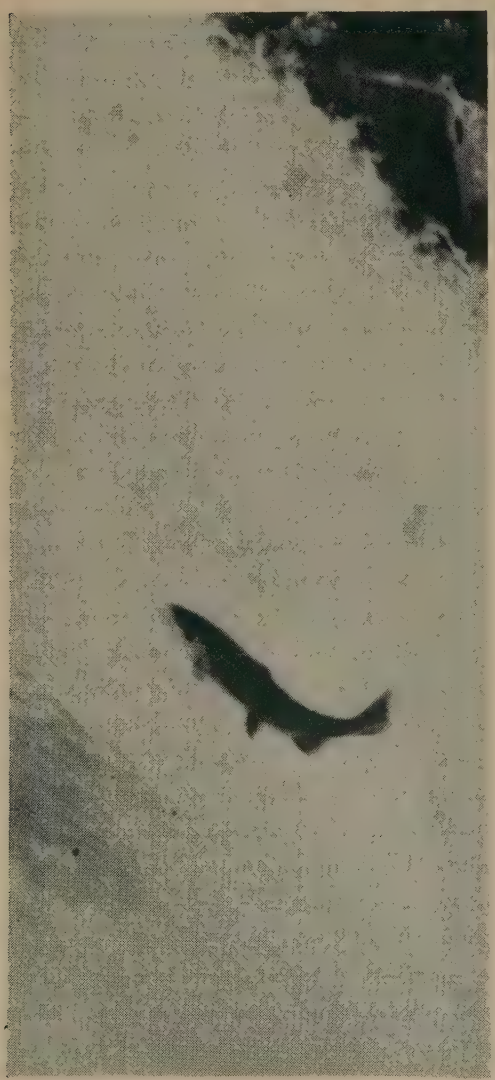
A similar Nature leadership course is offered especially for children. Older children learn to conduct Nature trips for their younger friends. To both adults and children who successfully complete all assignments, a certificate is issued.

Not only in Washington, D. C., but in other cities, too, metropolitan residents are enjoying similar adventures in Nature in their own parks, back yards, and nearby woods and streams.

More and more communities are giving their men, women, boys, and girls an opportunity to differentiate a harmful rattler from a non-poisonous snake, recognize the three-leafed poison ivy, smell a skunk cabbage, tease a touch-me-not plant, know the common trees and wild flowers, and meet the birds in the field.







Steelhead Succeeds

By HUGO H. SCHRODER

BARRING the way of the steelhead trout on its way up the Wind River, Washington, is a series of three falls. If the fish is to carry out its spawning mission it must leap these falls. The first level is a jump of only a few feet, the second a more difficult barrier, and the upper jump a real test of the strength and persistence of the steelhead.

In the picture above, at the left, the fish is in the middle falls, and, at the right, above, is about to go over the seething water of that falls. In the picture at the left the steelhead is preparing for the extreme effort of the final leap over the upper falls. The photograph was taken from a ledge overhanging the falls and looking down at the water. In the picture at the right the fish is about to attain its goal, the stream beyond the white water. As it makes ready for the final effort the steelhead swings its tail like a polevaulter clearing the bar and its courage is rewarded.

North American Wildlife Conference

"The Place of Wildlife in a Changing World" was the theme of the Eleventh North America Wildlife Conference, held in New York, March 11 to 13, under the sponsorship of the American Wildlife Institute. It was a well-attended meeting. Technical and general sessions attracted large and interested audiences, and the addresses and discussions served, after a lapse of two years, to create a reasonably clear picture of the situation in which our wildlife resources find themselves today.

To those interested in wildlife, as game or for itself, the Conference was stimulating and challenging, but it certainly was not reassuring. It was conclusively proved that our game birds and mammals face a tremendous increase in hunting pressure. As indication of this, Dr. Ira N. Gabrielson, retiring Director of the U. S. Fish and Wildlife Service, cited the startling growth in the number of duck hunters, and the increase in the numbers of licensed gunners in the States. He warned that we are entering another drought cycle menacing to our migratory waterfowl; that the exploiters are becoming stronger and bolder; that a tremendous development of highways, air fields and dams is planned; that areas heretofore reserved for wildlife will be penetrated; that the protection of isolation will be removed; that pollution of streams is increasing to a devastating degree.

To meet these threats, Dr. Gabrielson saw hope in the results of fifteen years of constructive work; in a better informed public; in the increase in the number of trained technical workers. However, he declared, this is no time for conservationists to pat themselves on the back, or indulge in any complacency.

In relinquishing what he described as the "hot spot", Dr. Gabrielson is turning it over to Albert M. Day, who as Assistant Director of the Fish and Wildlife Service, has been, as "Gabe" put it, "close enough to the hot spot to know how hot it is." Mr. Day made a courageous address to the Conference, speaking on the problems created by increased hunting pressure on waterfowl. He warned that "sportsmen are going to be searching out every bit of wild country they can find. Ducks, rabbits, bass, trout, and *game administrators*—look out!"

The new Director reported that all the best observations point to a decline in waterfowl numbers during the past two seasons. "We have," he said, "overshot our annual increase during the past two huntings seasons. . . . The population has declined in those two years. . . . The annual regulations provide the only quick means of adjusting hunting pressure to supply. . . . Marsh restoration and protection are highly important. . . . Mother Nature is the prime factor in production. . . . We can do much to improve wintering conditions. . . . Better public understanding is essential. . . . And *authentic* publicity is highly essential."

Mr. Day elaborated on each sentence quoted above, and, on the last point, pointed out substantially what we pointed out on this page last month with respect to the misleading publicity about Ducks Unlimited. He asserted that such exaggerated statements are "an example of why we need sound, sane publicity, based on facts, and not on fiction. . . ." Mr. Day forecast lesser bags and shorter seasons as a means of meeting the increased gunner demand for migratory waterfowl.

A considerable jolt was delivered to the Conference, at its first general session, by E. Sydney Stephens, Chairman of the Missouri Conservation Commission. He declared that only a handful of the present Fish and Game Commissions are efficient; that the majority are understaffed technically; that most of them are politics-ridden; that, generally, we are administratively unprepared for the immediate task on the State level. He charged that only a very few of the outdoor writers are writing anything but the usual drivel about individual hunting and fishing exploits and the like; urged the importance and real news value of conservation facts.

Largely on the positive side was a general session on education in wildlife conservation, which brought together the views of college president, newspaper editor, college professor, radio commentator and federal and state education specialists in the wildlife conservation field. Their addresses and the discussion should be read in their entirety in the Transactions of the Conference to be published later.

Our impression of the conference, based upon the sessions and many conversations with those in attendance, is that the war period has not resulted in too much lost ground in wildlife conservation, but, rather, has been relatively a period of marking time. Technicians are now returning to the conservation ranks from war service. Projects suspended are being renewed. Educational work, at a minimum during the war, must be pushed with renewed intensity. And, above all, vastly greater hunting demands upon our birds and mammals classed as game must be met with courage and firmness by administrators. Their hands must be strengthened by the support of everyone whose interest in wildlife is unselfish—the selfish will be ever with us.

R. W. W.

Berkshire Garden Center

A Big Idea that Started Small and Grew

By ANDREW S. WING

Garden Editor of Nature Magazine and Executive Secretary, National Garden Institute

GARDEN centers seem to be as inevitable as gardening itself. There are active and useful centers in most sections of the United States. Rather famous ones are located in such cities as Cleveland, Chicago, Buffalo, Pittsburgh, Wheeling, Detroit and Fort Worth. Other busy industrial centers are becoming so garden-minded that garden centers are bound to develop. Even New York, blasè and money-minded, is in the throes of a movement, which, it is hoped, will culminate in a real garden center where a full-time horticultural expert will be employed.

Victory gardening has had much to do with the development of this garden center idea. Interest in gardening was greatly stimulated by the war, but even before the war, garden centers were cropping up like mushrooms, some of them to wither just as fast. Yet it is good to note that many are alive and flourishing today.

Tucked away in the green hills of western Massachusetts is the Berkshire Garden Center, a unique institution in the world of gardening. Servicing a largely rural area, composed of a number of scattered communities, this center offers a service so worthwhile that its fame has spread far and wide. In fact, it enjoys the membership and support of gardeners and organizations that are not even in the state of Massachusetts.

The director, A. Kenneth Simpson, a youngish man in mind and spirit, has been in charge since the group was first organized in November, 1934. He has watched and helped the Berkshire Garden Center grow from a humble beginning to a live and substantial institution.

Naturally, garden centers do not just happen. Someone starts them and keeps them going. The idea for this one originated in the mind of Mrs. Bernhard Hoffman, who gave the land and buildings, and was sponsored by the Lenox Garden Club, of which Mrs. Carl A. deGersdorff was then president. "It is proposed to start a Garden Center in Berkshire County," read the modest appeal of the first notice that was sent out, and which was signed by six nearby garden clubs—Lenox, Richmond and Northern Berkshire, Richmond Valley, Great Barrington, Pittsfield, and Alford. Other founder organizations included the Lenox Horticultural Society, the Stockbridge Grange, Stockbridge Library, and The Garden Club Federation of Massachusetts. Those familiar with this region are aware that it has long been a popular summering place for families of wealth and social position, as

Part of the grounds of the Berkshire Garden Center, which covers five and one-half acres of land, permitting varied development of demonstration plantings, from herbs to vegetables.

PHOTOGRAPH BY GOTTSCHO-SCHLEISNER

The headquarters building of the Center with a part of the Victory Garden demonstration planting in the foreground.

PHOTOGRAPH BY HAYDN MASON

well as for writers, artists and musicians. The Berkshires have long attracted an interesting group of people. A background of gardening tradition in the region also, undoubtedly, helped in starting a garden center movement. There have been a few generous gifts of equipment and money.

The impressive fact stands out, however, that the Center is for the average home gardener in this Berkshire country, not merely for those who can afford to hire professional gardeners. Every detail, including the annual budget, is modest.

The initial plan specified that the Center was to be "for a year's trial. . . . A plot of land with a suitable building has been offered. . . . If the experiment is a success it is hoped the Center may become a permanent institution."

The founders little dreamed how quickly the young venture, so modestly launched, would blossom into an institution of renown.

The objectives of the founders, however, were neither timid nor modest. These included: 1. A gathering place where amateur gardeners may meet. 2. A reference library. 3. A file of catalogs and a plant buyers' index. 4. The services of a resident horticulturist, who will carry on an experimental garden, give advice and information free of charge to all members, and try out and report on new plants and seeds. 5. A plant and seed exchange for members. 6. Monthly meetings or field days. Special programs each month, talks or flower displays. Monthly children's programs.

The Garden Club Federation of Massachusetts voted to encourage the Center, and to make it the focal point of their annual pilgrimage the following spring. That put the sponsors of the Center on their toes; they *had* to be ready!

At the first meeting in November, 1934, which was attended by thirty-five people, Mrs. Bernhard Hoffman was elected president, and at a meeting held a month later, Mr. Simpson was engaged as horticultural director. He had a sound background, having been manager of a large estate, and, before that, an entomologist for the U. S. Department of Agriculture. More important, he had the enthusiasm and personality so essential for such an ambitious community undertaking.

The first year, 1935, was largely one of sod breaking and organization. With little equipment and few tools to start with, the new director went to work with energy and gusto. Land for the trial gardens was plowed and fitted, the house was furnished with simple things, mostly donated, Mr. Simpson and his wife occupied one side of the house, the other side being a small assembly room and a tiny combination office and library. On May 22, a pilgrimage of forty members and officers of the Garden Club Federation of Massachusetts arrived. Although the season was late, and not even the apple trees were in bloom, the visiting gardeners overlooked the sketchiness of the new Center and enthusiastically endorsed the project.

That summer, Mr. Simpson freely admits, was one of trial and error. But progress was definitely made. A Nature walk for children was held by the warden of Round Hill Reservation, Connecticut. This proved so popular that it has become a yearly event. A dry wall bordering the highway was undertaken, and a day-lily garden was laid out by Mr. Edward F. Belches, a landscape architect who has contributed much to both the beauty and the "master plan" for the Center.

Autumn found the new Center well on its way, but income from memberships and gifts had not kept pace with expenditures. A Harvest Festival was staged on October 15. It brought young and old together in a rollicking old-time fair. Fruits, vegetables, cider, apple butter, homemade bread and cakes were sold. "Pop your own corn" read one sign, and the

Plantings at the Center are all worked out on the basis of a "master plan" for gradual development.

PHOTOGRAPH BY GOTTSCHO-SCHLEISNER

pony rides made a hit with the children. So successful was this festival, both as a money-raiser and a social event, that it has become an annual occasion to close the garden season.

The next year, 1936, the Berkshire Garden Center was incorporated, and a number of new projects were undertaken. One of these was a planting of native shrubbery along the highway, which won a prize in the *Berkshire Eagle's* Highway Beautification Contest. The property, consisting of buildings and five and one-half acres of land, was then formally deeded to the new corporation.

The years 1937 to 1941 were devoted to healthy growth and development. As herbs came into the limelight, a plot was devoted to these pungent plants. A home for Director and Mrs. Simpson was acquired across the road, releasing space for a larger assembly room to accommodate the growing membership. A kitchen was thus made available so that tea could be served after meetings. The children's program was expanded, and several other events were staged, such as a country dance and a fashion show. These both added interest and raised needed funds for the growing Center.

A dwarf fruit orchard was planted as a gift from the Great Barrington Garden Club. This also included grape vines and flowering crab apple trees. In 1939 the Center set up a model garden center exhibit at the New York Spring Flower Show, in cooperation with the Boyce Thompson Institute. A display of woods, a hobby of Mr. Simpson's, was shown at the New York World's Fair. In 1940 a "shady area" was made possible by the Williamstown Garden Club. In sharp contrast, a "sun-heated pit" was constructed with the help of royalties from the Center's own *Book of Herb Cookery*. A flower show for children was held in August, followed by the annual Harvest Festival in October. In brief, the young garden institution was beginning to throw its weight around.

National recognition came in 1941 in the form of a medal award from the National Council of State Garden Clubs "for the Garden Center which, in proportion to its size, has performed the greatest service to the community." The same year a legacy came from Mrs. Carl A. deGersdorff, a founder, of $2500 to be used as a start on an endowment fund. Endowments and reserve fund now amount to about $6000, in addition to the real estate. Not a princely endowment, but a substantial backlog.

Vegetable gardening came into the program in 1941 as war clouds began to darken the horizon. A demonstration home vegetable garden was planned in cooperation with Prof. William R. Cole of Massachusetts State College. A plot 30 by 100 feet was planted, the idea being to supply a family of three with fresh vegetables and a surplus for canning and winter storage. As crops ripened, Miss Evelyn Streeter, home extension agent, conducted canning classes demonstrating proper methods of preserving. A monthly club bulletin, *Cuttings*, was also started in 1941.

Victory gardening came into full bloom in 1942. A two-day course was held in April, aided by Professor Cole and Miss Anne Webb, assistant to Director Simpson, who had taken a winter course in victory gardening at Lowthorpe School in Boston. A ten-weeks course in nutrition and a new series of canning lessons also brought a large attendance. Another food garden was planted, also a garden of small fruits, and a "Youth Garden" cared for by one of the small boys, under the supervision of the 4-H Club Berkshire Garden Center, really went "all out" for home production and preservation during the war years, ably assisted by the county and state extension services. The membership reached 618 and interest was keen, in spite of the curtailment of the lecture program because of gasoline rationing. The Harvest Show was continued.

In recognition of its educational exhibits and "its cooperation with the gardening public", the Massachusetts Horticultural (Continued on page 276)

Off the Beaten Track with the USO

By PATTIE S. SMTIH

Clarence H. MacDonald, USO Pacific Seaboard Outpost Director, displays a young albatross of Hood Island, Galapagos archipelago. The youngster was not yet quite ready to fly, although it already has a wingspread of about eight feet.

TALES as tall as the Andes and as colorful as the stories of W. H. Hudson are coming out of USO reports today on its work in the jungles of Central and South America. With wartime restrictions lifted, the story can be told of the vast network of USO outpost services for men stationed at isolated spots from Guatemala to Peru. By plane and crash boat, by tuna-boat and converted private yacht, its outpost workers have traveled thousands of miles a month to take information, recreation and a breath of America to men hungry for reminders of civilian life.

Throughout the war years the USO, at Army request, put on a sort of "triple-threat play" at these jungle outposts, in teaching the men how to recognize and avoid dangerous reptiles and other hazards of jungle life, in organizing jungle trips to capture notable species of wildlife, and in demonstrating hobbies that make use of crocodile skins, and other animals and plants indigenous to various regions. An important part of their work lay also in the sheer entertainment they could provide, through live talent shows, dances, and radio and dramatic features.

Most practical and valuable, perhaps, has been the "Jungleology" program conducted by Stanley M. Hamilton, Director of the USO Atlantic Outpost Service, and Clarence H. MacDonald, Director of the USO Pacific Seaboard Outpost Service, with the active cooperation of Kenneth W. Winton, Professor of Science at Balboa (Canal Zone) Junior College and an expert in jungle lore.

"When we do not fly," wrote Mr. MacDonald, "we pack our specimens in an old station wagon and sally forth to airforce positions available by road and adjacent to Panama. We carry along bottled specimens of most poisonous snakes, insects and plants that might injure service men. We also carry along a few live boa constrictors. These are a great help in breaking down phobias and superstitions about Nature. . . . It is interesting to see the lifelong horror of service men of snakes, spiders, scorpions, etc., break down within an hour of straight talk about the environment in which they are now living, the jungles."

On one trip by plane to the Galapagos Archipelago off the coast of South America, Mr. MacDonald took along a cage of snakes. Just as the plane was about to take off, two startled colonels found themselves face to face with the reptiles, which were staring with ophidian fascination at their silver eagles. The officers wanted to know what was going on. When Mr. MacDonald explained, the colonels, mollified, used the top of the snake cage for a game of cards that lasted 800 miles. At the next Jungleology lecture they were both in the front row.

While in the Galapagos, it was the custom of the USO workers to take men on expeditions to collect and study strange and marvelous tortoises and other reptiles and creatures found on these remote islands.

"We were very fortunate in capturing two of the giant land iguanas," wrote Mr. MacDonald. "They are truly vicious upon capture. The largest one was about three feet long, stockily built and therefore unlike the common iguana of Central America. We were also lucky to capture another type, called the marine iguana, which is jet black and semi-aquatic, and also found only on the Galapagos Islands. This is a gentle lizard, unlike his tough cousin of the rocks, which lives on thorny cactus."

A trip to an extinct volcano yielded a glimpse of the rare blue-footed boobies. There were hundreds upon hundreds of them nesting, some with fuzzy youngsters sitting beside them. Apparently unafraid of man, they never moved and only pecked at the G.I.s attempting to take a peek at their eggs or family.

Next, a placid family of seals, and two small, fearless Galapagos tortoises did not object to the soldier visitors coming within a few feet of them. Pelicans

and penguins, black and brown finches, native doves, and, at Hood Island, a species of albatross, attracted the sighteseers.

After the ending of hostilities the Army permitted USO workers to visit men stationed at San José, off the coast of Panama. According to ancient native history of this island, it was once inhabited by hundreds of Indians, but there was not a soul living there when the Army took it over for experimental purposes. The legend is that an Englishman, his wife and beautiful daughter homesteaded this island about 80 years ago. One night they were attacked by natives and the man and his wife were slain, and the daughter, who escaped into the jungle, became violently insane. At night the natives prowling off shore in their canoes could hear her wails and screams, seeming to emanate from the deep jungle —and this had frightened them away.

But the USO workers started the service men hunting Indian graves, explaining what to look for, and how to identify a burial. It became a fascinating hobby for men with too little to do in their leisure time. In fact, so zealous were they in pursuing the hobby that two men got lost and had to spend the night in the jungle. "They did the proper thing," according to Mr. MacDonald, "and spent the night in a big tree." And from this hobby of searching for ancient graves evolved the Ghouls' Club.

The "Jungleology" program of the USO is designed to prepare men for safe existence in the wilds. Here, Kenneth W. Vinton displays a nine-foot boa, while Sgt. G. E. Stealey admires a five-footer. Mr. Vinton helped to establish the USO program.

In the wild Darien jungle country between Panama and Colombia, where once the Spaniards had fought the Indians for gold, the USO workers received one of their unusual requests. The head man at an isolated trading-post was a native, not an Indian. He came to see Mr. MacDonald early one morning, to ask a big favor.

"He had seen me with my camera," Mr. MacDonald related, "and was fascinated with it. His grandchild had died during the night, and he begged us to take a picture of the dead baby before they buried it that morning. Nothing would please him more, as the picture would be the medium by which they would always 'remember' the child! We gladly consented. We could not take a picture of the body in their tiny palm leaf shack, so we had them bring it out in front of their abode. Taking the picture created quite a scene, as all the villagers were on hand to see the job done. We have had many requests in our work, but this was a new one."

A rough trip on a tuna boat, on which he was the only passenger, to remote islands off the coast of Panama and Central America, unexpectedly gave Mr. MacDonald a chance to complete his collection of reptiles for his jungle talks. The tiny boat passed through a group of islands where the rare and little known sea snakes are found. They are so deadly that the natives are afraid of them, and have a saying: "Picar — muerto" — "Bite—you die." But, the question was, how to catch one?

The skipper of the boat obtained a very long pole to which he secured a number of fish hooks on the end like a grapple. A snake was swimming on the surface just ahead. The skipper slowed down the boat, and as the sea snake continued to sail along in its leisurely fashion, the crew hooked it, and drew it aboard the raft.

The serpent was about three feet long. The top of its back was jet black, and the lemon-yellow sides blended into a pretty reddish-yellow on the belly. What puzzled the USO worker was the fact that this snake did not have conspicuous fangs. Its tail was flat like a rudder and beautifully marked with distinctive yellow and black blotches. The skipper became so interested that he promised to capture more of these for the USO.

To men shut off from civilization, and without civilian companionship, hobbies are a "must," to prevent loss of morale and even breakdown. The outpost hobby work of the USO was of vital importance in the war effort, to relieve the stresses of men guarding strategic outposts or performing secret war services.

Throughout the war years, the USO stimulated interest in the creation of attractive and rare articles from native products such as hard woods, nuts, sea shells, sea beans, orchids, butterflies, insects, reptiles, shark skins, and other local animals and plants.

With the advent of V-J Day this hobby program was vastly increased. USO was asked to rush materials and instructions to men on hitherto "super-secret" islands. To the studies of plants and animals were added sketching, painting and clay modeling. Photographic materials, more plentiful now, were shipped out as fast as possible, so that men could take pictures of the rare orchids, and marine and jungle life.

Some of the Nature lore of the USO focuses on the care of pets. A group of lively but lonely Navy men lavished all their affection on a well-groomed Peking gosling that one of them had purchased at a native market in Panama. They built a fenced-in yard with wire netting all around and over it, for her protection. But even that did not help. One night a Panamanian boa constructor swallowed her.

Native pets of all kinds are popular with men stationed overseas. One group of men in the Darien Indian country had collected a zoo of their own. They had a coati, a strange little animal with a long snout, that looks like a cross between an anteater and a raccoon. It is smart and makes an excellent pet. They had also captured a "kinkajou," which is the Central American "honey bear." Then there were parrots, parakeets, songsters and one beautiful, intelligent macaw in all his brilliant plumage and glory. "I honestly believe," says Clarence MacDonald, "that they realize how good-looking they are, as they act very conceitedly around other birds!"

And then he added: "In many outposts our boys have monkeys. Panama is alive with many kinds of monkeys—but at this one base a most unusual thing has occurred. Two full-grown black spider monkeys have adopted this outpost. Every morning at daybreak they come trooping in to spend the day with the boys, then return to the jungle each night. These monkeys are big and usually walk upright—and what clowns they are! The commanding officer of this outpost, as well as the men themselves, told me that if it were not for these two 'screwballs' they would be bored to death at this lonely station. Two black spider monkeys have become morale-builders!

"I visited this outpost two weeks ago, and the moment I had finished climbing up the long, steep hill to the station, out came one of the monkeys to meet me, with his arms waving and walking as erect as possible. He had become a sergeant since my last visit! Yes, believe it or not, that monkey was a full-fledged non-com. The boys had shaved three stripes on his black, powerful, hairy arm, and thereupon painted in with white paint three sergeants' stripes. This was a new kind of 'monkey business.' "

Today many men are still stationed on the islands of the Caribbean, in Central America, and on the lonely coasts of South America. They must remain there, for garrison purposes, or to await transportation home, or until they have enough points for discharge. And so the USO Outpost work will continue in full force to give recreation, emotional release and chance for self-expression to men longing for home.

Plants with "Hybrid" Names

By REY F. HEAGY

MANY plants take part of their popular name from some bird, mammal, fish, reptile or other animal, as, for example, cattail. In the list below the missing words are represented by asterisks, one for each letter. Replace the asterisks with the missing letters to make up the name of the animal that provides the "hybrid." The spelling, as to hyphenation and otherwise, is according to Webster's Unabridged Dictionary. You should be able to get thirty with little difficulty. Thirty-five would give you a B average; forty an A minus; forty-five an A. All fifty correct, without peeking on page 273, where the answers are, would be "out of this world."

1. ***mint
2. ***** cabbage
3. ***** lily
4. *********-berry
5. ******** vine
6. ***slip
7. *********'*-ear
8. **eye
9. ******* flower
10. **** brush
11. ***grass
12. ****bane
13. ********-weed
14. *****'*-ear
15. ****** lily
16. ****wood
17. *****flower
18. ******* berry
19. ****seed
20. *****foot
21. ********* grass
22. ****bell
23. ****thorn
24. ***** grass
25. ********** root
26. ***glove
27. *****'*-rue
28. ****foot
29. ******-root
30. *****mint
31. ***** laurel
32. ****bush
33. *******'*-tail
34. *** balm
35. *****'*-quarters
36. ******-head
37. ****spur
38. ******-berry
39. ****** flower
40. ********* pear
41. ***bane
42. ********* weed
43. ***weed
44. **** lily
45. *****weed
46. ******** brush
47. ******** corn
48. ****bean
49. *****weed
50. ******** flower

Nature and the Child

By CHARLOTTE HILTON GREEN

PHOTOGRAPH BY L. R. HARRILL

The author takes a group of today's children—4-H Club boys and girls—on field trips similar to those described in her article.

"INTEREST the child in Nature and you will unconsciously teach him humaneness, for no child can know the life-history of a bird or animal, and not become more humane toward that bird or animal."

This advice was given in a class in Nature-study, by that grand "Mother of the Nature-study Movement," Anna Botsford Comstock. And how many times since have I drawn valuable returns from putting that precept into effect! I shall never forget how it had helped me when big Joe Chinchuck, the oversized fifteen-year-old in the third grade of my one-room country school, succumbed to birds.

Joe had stubbornly and scornfully—and seemingly proudly—held out all year against "dat stuff," which the other children had found fascinating. One day in late May in a studied, off-hand manner, and very secretively, Big Joe had come to me. "If you wanna come down the Barden Road wit' me, I'll show you somepin!"

And in the end it was Joe—big, awkward, slow-moving, slow-minded Joe—who had found a hummingbird's nest. The children had been seeking such a nest all through the school year! "Even an old one, teacher," they had said, during the fall and winter. In the spring the hunt was on again, for a hummingbird's nest just *must* be found. The experience of John Burroughs, indicating how rarely a nest was discovered, had challenged them.

Finding the nest was Big Joe's first experience with pride of accomplishment. He, too, was an explorer, and no Balboa standing upon a peak of Darien was ever any prouder. First, he showed teacher, carefully and gently pushing aside the sprays of the syringa bush by Aunt Mattie's house. There, cleverly concealed, was the tiny nest, a veritable bit of fairy architecture, with its two small, white, bean-shaped eggs.

Big Joe had learned much by watching. He knew what the mother-bird looked like; how she lacked the ruby throat; that she had small white spots on her tail. He had observed, too, that the male was nowhere around, that the lady bird had been alone in building her nest, incubating her eggs and would apparently have to rear her young without any aid or protection from her mate. "He ain't no good to her. He oughta be ashamed a' hisself," said Joe, matter-of-factly.

Joe, slow though he was, was learning that, even in the bird world, it is best to be cooperative.

"Interest the child in Nature and you widen that child's horizons, develop his powers of observation, a love of the beautiful, and appreciation of form, texture, and sound. It gives the child a sense of companionship with the out-of-doors, and is an asset to health in keeping him there. To the teacher and to the parent, equally, this absorption in the natural world about him is a three-fold blessing. Both at school and at home it tends to do away with many problems of discipline, and at home, in particular, it often answers the perpetual question of 'What can I do?' "

I thought of these words of Mrs. Comstock, when sensitive, lame Maggie met me, breathless, one school morning. "Oh, teacher, c'n you come home with me for supper tonight? It's my birthday an' we're going to have ice cream an' cake, an' Mother said I could ask you, *an' my tree's got tulips on it!*"

Life had turned a new, fresh, and much happier page for little lame Maggie when she became interested in the outdoor world about her home and school. That year we had discovered an old copy of Thoreau's *Walden* on the school library shelf, and we had decided to adopt for our school slogan one of Thoreau's passages: "I have traveled a great deal in Concord."

We, too, decided we would travel a great deal in our own district, and with field trips always popular we became familiar with all the spots of natural beauty, the little brooks and ponds, the hills and

PHOTOGRAPH BY W. BRYANT TYRRELL

Big, awkward, slow-moving, slow-minded Joe found the nest of the hummingbird, and, with it, the understanding of accomplishment.

valleys and ravines, the woods and upland meadows, the bog and the old rock ledge, even the chain of three lakes in the next district. Sometimes we made collections of wild flowers and ferns for the school's wild flower garden and fernery. We did not pick the rare lady slippers we found in a certain woodland, nor the still rarer walking fern we found on the face of a cliff in a cool, shady, damp ravine. We knew they would not grow in our garden, so we left them there "to grow again another year in their own habitat." The children formed an "Explorers' Club"; they were "Thoreau's Young Explorers," and many were their adventures.

But, to return to little Maggie. I went home with her that night and saw the attractive, tulip-like flowers that give the tree its name. That was the year in which the children had each chosen an individual tree—and bird—with which to "live intimately throughout the year," and about which each was to become an authority. Coincident with the opening of school in September each child chose his tree and bird, and began a close association with it. With the tree, if it were a deciduous one as was Maggie's tulip tree, there was still time to know the tree in its green foliage of summer, in autumn coloring, and in winter, when it was "at leisure."

Throughout the long northern winter, each child, instead of regarding his or her tree as something bare, cold, and dreary, sought out its beauty of bark and outline. Maggie loved the tall straight bole of her tree (how those children liked to use that word "bole"), its graceful strength, its branches laced across wintry skies. The children began to understand that, at that time of year, such trees stand revealed, ready to tell their utmost secrets to those who love them. Maggie was particularly intrigued by the winter buds, for those of the tulip tree are distinctive and an aid in identification. She knew, too—as did the others with their trees—about its leaf-scars and bundle-traces. They all became familiar with their own tree's outlines, and enjoyed contrasting them with other trees, as the graceful vase-like form of the American elm with the sturdy oaks, and the sugar maple with the slender, swaying birch.

In the winter, too, they became familiar with the fruits of their special trees—if those trees fruited then. Maggie liked particularly the "cone" of her tree with its dainty, winged and weighted seed that cedar waxwings and pine siskins, in particular, loved to feed upon. I remember her standing under her tree, laughing with glee as a flock of waxings were feeding, and the seeds, with their tiny propeller-like blades, came spiralling down about her.

They liked to compare the fruits of their trees—the differences between those of the various hickories, between the walnuts and butternuts, the acorns of the many oaks, and even the "keys" of some of the maples. Through their own observation and questioning, and "looking up" in the tree book, they finally realized that some of the trees, as the red maple, which was Mabel's tree, did not fruit in the fall but in early spring, before some of the other trees had even blossomed.

In the spring, with the unfolding of the leaves,

Once the teacher and class walked five miles to see the dogwood, rare in the region of western New York, in the full splendor of its bloom.

PHOTOGRAPH BY SOLOMON KURTZ

they observed the colors of the delicate young things on their various trees, the exquisite mauves, pinks, lavenders, bronzes, reds, and carmines, as well as their soft, often furry texture. Thus, color and texture and form were added to their consciousness.

When flowering time came in woodland and orchard (some children had chosen their farm fruit trees for their own "specials") they learned that all mature trees bear flowers (with rare exceptions). With my hand lens they delved, fascinated, into the mystery and beauty and golden magic of pollen and of the parts of flowers. Such words as "stamens," "anthers," "stigma" and "pistils" became commonplace. Children love to use new, strange words. Sometimes, when we stopped to rest on field trips, we would have a "Nature Spelling Down."

In the schoolroom, whenever we came across a new and grand-sounding word connected with our Nature-study we would write it down on the board in a special corner, where it could be left undisturbed. Since "Teacher" had a pair of binoculars that the children were free to use, that word headed the list, with other such words as "petiole," "deciduous," "stomata" and "lenticels" of plants; and "mandibles," "primaries" and "nape" of bird lore. Since they were not required for their regular spelling lessons, most of the children thought these words were fun and vied with each other in being first to learn them.

The American elm, with its graceful, vase-like form, was the first tree that the children learned to identify at a distance.

Always, on our field trips, each child watched out for his particular tree, and there was friendly rivalry over who counted the most specimens of "his tree." One sparkling, autumn day, with goldenrod and chicory lining the dirt roads, with the maples aflame and Lake Erie in the distance blue as the sky above with great, white, billowy masses of clouds, we walked three miles to see a hundred-year-old "stump fence" made of the upturned roots of white pines.

Again, in spring, we walked five miles to see a dogwood in bloom, for dogwoods are rare in that northern hill land. But the children had seen the picture of the flowers in Keeler's *Our Native Trees*, a well-thumbed volume by the end of the school year. They were anxious to see the lovely dogwood tree in flower.

We looked up the "largest tree" in the district, and took another long walk to see it. So large was this scarlet oak that we thought it must be at least three or four hundred years old. As we sat and rested under its shade, we tried to imagine all that it must have seen happen.

Throughout the year we visited the same woodlands and isolated trees, to know them in autumn, when the color parade was on; in winter, when they were bare, and, again, when they wore glittering mantles of snow or crystal; in spring when they were in bloom. And during all seasons we learned to listen to the winds in the trees, and found that Nature has a different tune for her winds, whether they go creeping softly or roaring through her various kinds of trees. We watched to see how the different trees reacted to storms, too, contrasting the rugged oak, which was tortured and buffeted by them, with the supple birch, which "bowed before the winds."

Trees and birds, in particular, were correlated with almost every subject. (That was before the days of "activities", then "correlations" was the big word in pedagogy.) And so we had trees and birds in geography, in spelling, in drawing, in language. We read about trees and birds, and we studied famous trees in history. We had pictures of the "Big Trees" of California. Every single child vowed that "Some day I'm going there to see them."

We even had trees in physiology, for when we had the lessons on the circulation of the blood, the children immediately became curious about the similarities and differences between it and the sap in trees. We were in a "sugar bush country", and the children were familiar with the "sap run." In fact, we had a "sugaring off" party in the sugar bush of one child's family.

By the end of the school year each child knew intimately and thoroughly everything about his own tree and, by association, comparisons, and interests in common, as well as our own general study of the other trees, much about the trees of his schoolmates.

and of the countryside in general. They had come into the tree-lover's full heritage.

What we did with trees, we also did with birds. Briefly, each child also chose a bird for the year. There were no duplications. Maggie had picked the bluebird, but when, early in September, she herself found the exquisite cup-shaped nest of the red-eyed vireo, suspended from a forked twig of her "very own tulip tree", she got the child who had chosen the vireo to "trade" with her.

Studying the birds' winter and summer ranges, we found that Maggie's red-eyed vireo, one of which had also nested in a maple in the school-yard, wintered in South America. We combined drawing, geography and birds that day, drawing outline maps of both North and South America, marking the breeding range in North America in shaded lines, and the winter range in South America in black. And lo, "Bird Geography" was born!

We studied birds' color, markings, migration, courtship, nesting habits, eggs; how birds incubated; how they cared for their young. We noted the plumage, and which males and females looked alike, as did the chickadee, which was George's bird, or which were entirely different in color, as were the male and female scarlet tanager that "belonged" to Marie. We wanted to know with how many of the birds the brightly-colored males changed colors and markings in fall and winter, as did the bobolink that had nested in Johnny's upland mowing, and was "his bird." How indignant Johnny became when, in one of the books I had brought from the town library, he read that in South Carolina his bird was called the "rice bird" and was killed by thousands!

Each child tried to find out something about his own bird's feeding habits, and whether they were not, as most birds were, an asset to the farmer and the orchardist. There was an ancient orchard next to the school. This became our field laboratory. We found twenty species nesting there that year, and learned that some twenty more sometimes nested in orchards. This particular orchard was not a modern, scientifically pruned one, but had old, big trees, with lovely low crotches for children to climb, and cavities and hollow limbs for hole-nesting birds. It had been in its prime in my father's boyhood, when some of its apples were shipped to Queen Victoria!

Most of the girls chose the attractive song birds for their own, but many of the boys preferred the more aggressive birds, the birds of prey—hawks, eagles, owls. The latter made interesting studies, for when they found a nest, the boys learned to look for the pellets, and by analyzing them we could tell something about what the owls had been feeding on. It came as a surprise to most of the children, and to their parents, that the barn owls, which they had so often shot, fed mainly on rats and mice and so were really an asset to the farm. Thus the children were learning something of the balance of wildlife.

And so, in that long ago year, a new world was opened to all of us, and I think the teacher learned much with the children. In the beginning she, too, had been a novice, but they learned together, some of it by the trial and error method. Sometimes the children found out something before she did, and it gave them great self-confidence. Why, they, too, could find out things for themselves! Together they were learning the song of the earth, and that it was a good one to know; a song with a great tune.

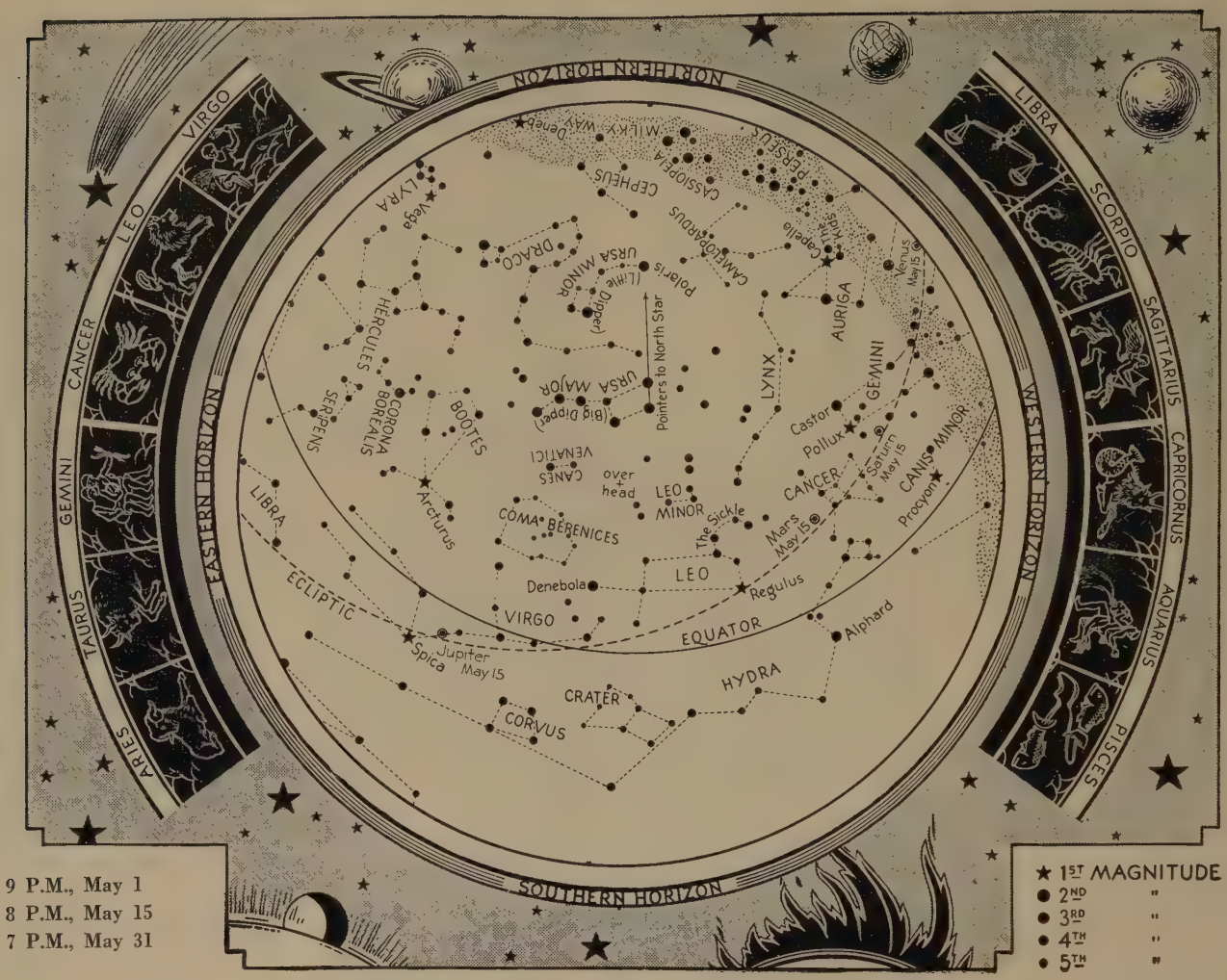
As Mrs. Comstock expressed it long ago in her classes—which the writer later was privileged to attend—"Nature-study cultivates in the child a love of the beautiful; it brings to him early a perception of form, of color, of music. He sees whatever there is in his environment, whether it is the thunderhead piled up in the western sky, or the golden flash of the oriole in the elm; whether it be the purple shadows on the snow; or the azure glint on the wing of a little butterfly. Also, what there is of sound he hears; he reads the music score of the bird orchestra, separating each and knowing which bird sings it. And the patter of the rain, the gurgle of the brook, the sighing of the wind in the pines, he knows and loves and becomes enriched thereby."

In these trying times, more than ever before, today's children—as well as adults—need to know this song of the earth. They need it as something actual and real to counteract too much of the vicarious partaking of the adventures of Superman and the Gang Busters. They need—how we all need—the peace and understanding that comes with a realization of this oneness with the earth, with the song of its hills and valleys, its streams and waterfalls, with its pictures of lazy white clouds billowing against a backdrop of deep blue sky. This song of the earth, too, is the song of the blossomtime of spring, of the fruition of summer, of the harvest of autumn as well as the gorgeous pageantry of the autumn parade. It is the mystery of the snow crystals of winter, billions on untold billions of them, with exquisite, infinite detail of a three-sided or six-sided pattern—and yet not any two of them just alike. It is the stars in the heavens above, and their reflection in some still, deep pool below. It is winged song—and the gold and azure and ebony of birds' wings. It is all the mystery and magic and beauty and peace eternal that surrounds and envelops the dweller of this good earth—if he uses all his God-given senses and is aware of its song.

Natural Query

By CHARLOTTE KRUM

The little boy stared
  At the black-and-white nun;
It was perfectly clear
  He had never seen one.
His eyes were quite round,
  His expression most sanguine,
As he asked the staid Sister,
  Please, *are* you a Penguin?



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Discovered Planets

By ISABEL M. LEWIS

FIVE of the nine planets of the solar system have been known to man from remotest antiquity. All of them, with the exception of Mercury, which can be seen only under favorable circumstances because of its closeness to the sun, outshine, or rank with, the brightest of the stars. Venus is the earth's twin in size and mass, and by far the most brilliant, even, at times, startling in its splendor in morning or evening twilight. Mars, with its reddish color and strange surface features, is second to none in interest. Jupiter is the giant of the solar system, exceeding all other planets combined in size and mass; Saturn is unique in possessing a magnificent system of rings.

The remaining three planets of the solar system, additional to our own planet Earth, have been discovered within the last two centuries. Uranus was found by Sir William Herschel, by profession a musician, but a man with a love for astronomy so great that he became the greatest of observational astronomers. Sweeping the heavens for interesting objects—with a six and one-fourth inch reflector of his own make—on the night of March 13, 1781, he observed a small, peculiar-looking *cometary* object, as he thought, sea-green in color and with a hazy disk. Other objects besides planets have a disk-like appearance in the telescope, faint distant nebulas as well as faint, tailless comets. It was nearly a year before the fact was established by Lexell that the object that Herschel had discovered and named Georgium Sidus, in honor of King George, was a new planet. It was moving in a nearly circular orbit at a distance from the sun almost exactly twice that of Saturn, which, up to that time, was believed to be

the most distant of the planets. Many names were considered for this new world, but that suggested by the astronomer, Bode, was finally adopted.

Although the mean distance of Uranus from the sun is 1,785,800,000 miles, its actual distance varies 84,000,000 miles from the mean on either side. It moves in its orbit at the leisurely rate of four and one-fourth miles a second, and takes 84 years to complete one trip around the sun. It now lacks three years of completing two revolutions since the day of its discovery. The diameter of Uranus is about 32,000 miles. Its disk is decidedly elliptical in shape and sea-green in color. Its cold atmosphere has revealed, spectroscopically, the presence of methane and ammonia. Heavy bands in the red, orange and green are due to the presence of methane in sufficient quantities to produce a layer four miles deep. The planet's mass has been very accurately determined, and is equal to fifteen times that of the earth. Its density, however, is only about one and one-fourth times that of water, so that a body at its surface, weighing 100 pounds on the earth, would weigh only 90 pounds on Uranus. Although Uranus is the brightest of the three discovered planets, it cannot be found unless one knows exactly where to look for it, as it appears without the aid of a telescope only as a star-like object of fifth or sixth magnitude and near the limit of visibility to unaided vision. Uranus has a high albedo, or reflecting power, which implies that its atmosphere is cloud-filled; and the presence of faint belts, similar to those on Jupiter and Saturn, have been detected. It is believed that it has a dense and extensive atmosphere. The rotation of the planet has been found, spectroscopically, to have a period of ten and three-fours hours.

Uranus has four remarkable satellites, the brightest not exceeding 1000 miles in diameter. They are, with several faint satellites of Jupiter and Saturn, the faintest objects to be observed telescopically in the solar system. The two brightest, named Oberon and Titania, were also discovered by Sir William Herschel; the other two, Ariel, nearest the planet, and Umbriel, were not found until 1851, by Lassell. The brightest are of the 14th magnitude, and they can be detected with a 10-inch telescope under good seeing conditions. The strange fact about these satellites is that the plane of their orbits is inclined nearly perpendicularly to the ecliptic, and in that plane they revolve backward, or from east or west. The equator of the planet lies almost in the same plane as the satellites, and the direction of rotation of the planet is also from east to west, which is contrary to the usual direction of motion in the solar system.

It was not long after the discovery of Uranus before it was found out that the planet was perturbed in its motion by some unseen body. This disturbance finally reached what was regarded by astronomers as the "intolerable" amount of two minutes of arc, which is so great as to be almost visible to the eye without telescopic aid. Two young mathematicians, Adams of England and Leverrier of France, were working on the problem mathematically in the year 1846. Adams presented his results to the Astronomer Royal of England before Leverrier wrote his memorable letter to Galle at the Berlin Observatory, telling him to point his telescope to a certain position in Aquarius and he would find, within a degree of that point, a new planet looking like a star of the ninth magnitude but with a perceptible disk. Fate favored Leverrier rather than Adams, for Galle was in possession of a new star chart covering that region. This greatly aided the search, and within half an hour of the time the search was begun the planet was found as predicted. In the meantime, Challis, at Cambridge, England, was searching also, but by a more difficult method. Adams was rightly accorded equal honor with Leverrier in this discovery, which was regarded as one of the greatest achievements of mathematical astronomy.

Neptune, as the planet was named, is the twin of Uranus, as Venus is of the earth. Its diameter is about 31,000 miles, its mass 17 times that of the earth and its surface gravity 1.1 times that of the earth. The planet's disk is circular, and sea-green like that of Uranus. The two worlds are probably very much alike in their physical constitution. The spectroscope shows strong bands of methane, requiring a layer 25 miles deep to produce them in the atmosphere of Neptune.

The distance of Neptune from the sun is 30 times the distance of our own planet, or about 2,800,000,000 miles, and as it takes nearly 165 years to make one revolution, it has not yet completed two-thirds of one trip around the sun since the date of its discovery.

Neptune is invisible to the naked eye since it is about equal in brightness to a star of eighth magnitude, but it can be seen with the aid of binoculars. Its disk is so small that it is not easily observable without considerable (Continued on page 276)

Mount Palomar Telescope

By MARCUS Z. LYTLE

This is the crystal stairway,
Flung to the craters of the moon,
Where the chains of earth-bound eyes are cut
By glasses, micro-hewn.
This is the path to splendors
Of the comets, Saturn and Mars,
On to galactic nebulous clouds
Beyond the dim gray stars.
This is the boulevard that bears
Space and time together,
Fused into one by a billion years'
Dash from the light's last tether.

The School Page

Edited by E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

TWO PROPOSED LAWS

For many reasons this page has refrained from commenting on the many proposals calling for national and State subsidy for the study of natural history in its many aspects. For one thing, it did not seem as though the thinking had been sufficiently crystallized to warrant comment; for another, there was some doubt on the part of the writer that what this country needed was a new law or two. Certainly there was much doubt on the part of the writer that the way out of our difficulties is to increase the public debt.

However, it now seems that the near future is likely to call for a show-down on a few bills that have been pending, and now is the time to speak on their merits. The national bill most closely identified with legislation of this sort is, of course, that providing for the establishment of a National Science Foundation. If we are to subsidize particular groups by national appropriations it would seem that support for an organization such as is advocated in the Kilgore-Magnuson Bill, S. 1850, which was introduced in the Senate on February 21, 1946, would be justified. It appears to represent the pooled judgments of a number of senators and their advisors, who have been behind various bills designed to put America in a place of leadership in the science field and to keep her there. It should be almost trite to remark that unless America could hold such a position by one means or another it would cease to be an important factor in world affairs, and our domestic happiness and prosperity would necessarily become impaired.

S. 1850 would create a foundation the purpose of which would be to "provide support for scientific research and development, to enable young men and women of ability to receive scientific training, to promote the conservation and use of the natural resources of the Nation, to correlate the scientific research and development programs of the several Government agencies, to achieve a full dissemination of scientific and technical information to the public, and to foster the interchange of scientific and technical information in this country and abroad." Surely few can offer serious criticisms of a measure designed to attain these aims. A break-down of the law shows that it justly arranges for the nation as a whole to profit by the returns from the development of the program. It provides against too arbitrary influence of politicians on the activities of scientists identified with the work, and it makes reasonable plans for the security of those who take an active part in supporting the Foundation.

We have one suggestion, which seems to have been overlooked in the various printed discussions regarding this and other bills supporting the general idea. According to this new bill: "There shall be within the Foundation a Division of Mathematical and Physical Sciences, a Division of Biological Sciences, a Division of Social Sciences, a Division of Health and Medical Sciences, a Division of National Defense, a Division of Engineering and Technology, a Division of Scientific Personnel and Education, a Division of Publications and Information, and such additional divisions, not to exceed three in number, as the Administrator may from time to time establish after receiving the advice of the Board."

What impressed the writer, when first reading this bill, was the lack of sufficient specific support for the conservation idea. True, the bill is designed to promote the "conservation and use of the natural resources", but even this statement in the preamble shows ignorance on the part of the authors of the usually accepted definition of conservation as being "wise use". As stated in the bill, it would seem as though use and conservation were regarded as two different things, while, as a matter of fact, they should not be. And if conservation, as a philosophy, is not adequately represented in the declaration of policy of the bill how can we expect it to be adequately supported in any of the eight specifically established divisions? True, one might expect it to be considered as a part of biological science, but it is also a part of social science, of national defense and of some of the other divisions proposed. What we would like to ask is adequate support for the establishment, as the first of the three "additional division", of a Division of Conservation. More than that, we would like to ask that such a division be specifically established in the law itself, and not left to the discretion of the Administrator. Surely the conservation idea is as important a part of our national science philosophy as is the proposal that there must be a division of publications and information. And if health is of such importance that it has to be mentioned specifically as a part of the Division of Health and Medical Science, then the conservation idea is of sufficient importance to be mentioned definitely, either alone or with some of the other recommended divisions.

If any of you are interested in these views they might be communicated to your senator or to Senators Kilgore, Magnuson, Ferguson, Fulbright, Johnson, Pepper, Saltonstall or Thomas, all of whom have been prominently identified with the formulation of the present bill. If this method does not offer sufficient appeal, opinion expressed to your representative in Congress might yield results, since the House of Representatives usually has something to say about desirable changes in bills proposed by the Senate. A note to your senator or congressman should bring you a copy of this bill for examination, or it may be found printed in full in *Science* for February 22, 1946.

Another bill of interest to readers of this page has just been introduced into the Assembly of the State of New York. It even should be of interest to readers who live outside the State of New York. It was introduced on February 14, 1946, and is called an act "to amend the education law in relation to school camps, school camp demonstration centers, and the training of teachers and camp counsellors". It supplements an existing law that authorizes school boards to spend tax money for the establishment of camps. The present act calls for the establishment of demonstration camps at strategic places in the state in cooperation with existing school districts, teachers colleges and colleges or universities, and the subsidy of training programs and of scholarships for students qualified to profit by those programs. These scholarships are to be available to one hundred and fifty prospective counsellors, and are worth three hundred and fifty dollars for one calendar year. Provision is made to guarantee that the holders of the scholarships represent the various parts of the State, but the limits are not so arbitrary as to be unreasonable.

Should this act become law it will undoubtedly stimulate certain aspects of the kind of education for which the American Nature Association and *Nature Magazine* has been working for many years. Such developments, whether they become defi-

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nitely operative or not, cannot help but be encouraging to those of us who at times have felt we were fighting not only a lone but a discouraging battle.

Studies made in New York State indicate that only about nine percent of the youth of the State are reached by the many camping programs maintained by commercial camps, or by those sustained by various social agencies. This is obviously wholly inadequate, and it is encouraging that the State is thinking of going farther than it did when, in 1944, it passed the Desmond School Camp Bill authorizing communities to conduct school camps at public expense. When Governor Dewey signed this bill he said: "Not only does this bill supply an excellent means for benefiting the health and minds of children, but it constitutes a substantial aid in mitigating the causes of juvenile delinquency."

Just think how many of us would have sweet dreams if we learned that the Kilgore-Magnuson Bill had become the law of the land, with a Division of Conservation a guaranteed part of a National Science Foundation, and if we in New York heard, at the same time, that the Morgan-Hults Bill had become a part of the education laws of New York? Undoubtedly our dreams would be sweet for one night. Then we would awake more or less scared to death because of the additional responsibilities for service that such laws would of necessity demand. I rather think that most of us would accept those responsibilities with a grin on our faces, even though the acceptance of the responsibilities would certainly add a few more wrinkles.

S.O.S. from Manila

Carlos P. Romulo, Resident Commissioner of the Philippines to the United States, transmits to us the copy of a letter from the Department of Agriculture and Commerce of the Commonwealth of the Philippines, pointing out that before the war the scientific library of the Bureau of Science housed one of the largest and best known collections of technical and scientific publications in that part of the Orient. The library is no more, having been totally destroyed by the Japanese. Scientific literature is now sought to build this library back from scratch. Any contributions should be addressed for "Scientific Library, Bureau of Science, Manila, P. I.," and the office of the Resident Commissioner of the Philippines, Washington 6, D. C., offers to cooperate in the shipment of such material.

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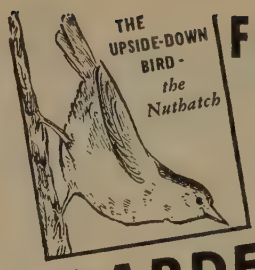

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NATURE STUDY

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Camera Trails

By EDNA H. and WILLIAM J. EVANS

A MAN we know wants to buy a camera. He has a special purpose in mind, one that is worthy of a good camera. He is planning a three-month mixed pleasure, business and semi-scientific trip to South America. A botanical enthusiast with a special enthusiasm for orchids, our friend will have plenty of opportunities to use a camera, and he should get some unusual pictures.

The camera he has in mind—if it exists—is the platinum-lined answer to a lazy photographer's prayer. In the first place, he wants a camera that will do everything our Graflex will, but without the need for "twisting and punching so many buttons and gadgets."

Our friend wants to be able to "see what I'm taking when I take it." This calls for a ground-glass focusing apparatus of some sort. A miniature camera does not appeal to him—he wants to take pictures "that can be used as-is, without being enlarged." On the other hand, he wants a camera small enough to carry around comfortably (he has seen us sweat under the weight of our Graflex and attendant paraphernalia).

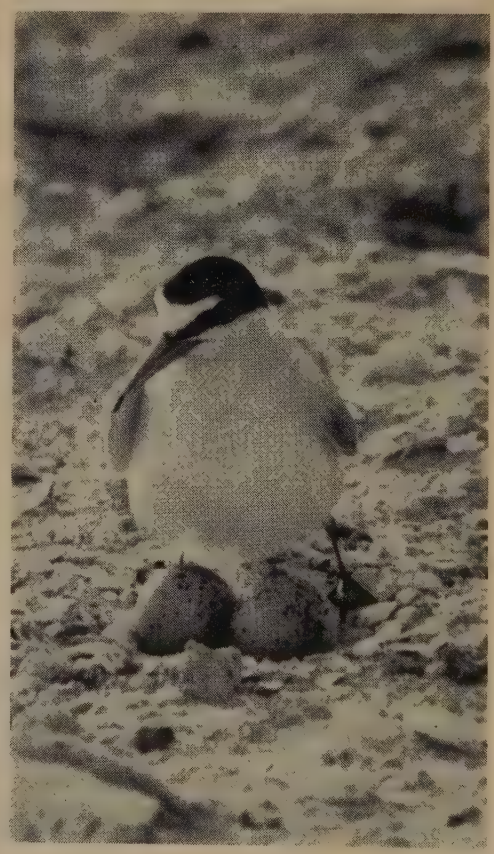
He snorts at the thought of "squinting through an exposure meter" before each shot. He is not interested in extra lenses, and filters are only remotely appealing. He has no use for a flash gun attachment, does not want to bother carting around a lot of flash bulbs. Yet we feel some of his best picture opportunities will require extra light.

Price is not too important, but we doubt whether our friend would care to go far over the $100 mark. After all, he is not exactly rolling in weatlh.

While we are a bit fearful of making an out-and-out recommendation, since our friend expects so much from a camera, we have discussed several different kinds and have explained the advantages and limitations of each. Now we are waiting with considerable curiosity to see which he selects.

Apparently the camera he has in mind will produce super-excellent results if the photographer merely points it in the general direction of his picture, pushes the button and mutters something like "abracadabra" or "hocus-pocus- wiggley-woo."

If our friend finds the camera of his dreams, we are going to get one just like it.



Mrs. Least Tern and her "nest".

NEW CAMERAS APPEAR

Now that new photography equipment is finding its way back to the market again, a perusal of the advertisements in any of the camera magazines is enough to make a hobbyist's mouth water.

All the old favorites are coming back, along with some newcomers that look mighty interesting. The new twin-lens Argoflex advertisements have caught our eye, although we have never actually seen the little camera in action. But amongst the camera equipment we have accumulated through the years is one of the original Argus models, brought out by the company some eight or nine years ago. That little camera has behaved admirably for us, although, of course, it has its limitations. Later models have built-in range finders, while ours does not. Other gadgets have been added, and now the company has brought out the twin-lens model.

The camera takes pictures two and a quarter inches square, gets twelve of these to a roll of film, has a top shutter speed of 1/200th of a second and a focusing range of three and a half feet to infinity. It looks like a fine camera for an enthusiast who wants good pictures without having too many professional aspirations.

PRACTICE WITH YOUR CAMERA

Every photographer, once he gets out of the box camera class, has his favorite type and make. Like automobile, radio, electric washing machine and refrigerator owners, some photographers will swear by one camera, while others would not be caught dead using that kind.

Newspaper photographers usually select one make of camera and stick to it, year in and year out. Their work demands accuracy, and in most cases they must get their picture the first time. Usually there is no chance for a retake. Some news cameramen take two pictures—others shoot only one. This type of photographer must know his camera and must have implicit faith in it, and in his own ability.

A hobbyist, on the other hand, is too often inclined to experiment with one camera after another, never using one long enough to learn all its "kinks" and idiosyncrasies. Thus, he blames poor results on the camera and is apt to overlook his own inefficiency in handling it. Experimentation is fine, but better pictures are the result of long practice and extremely friendly relations between the cameraman and his camera.

BIRD PICTURES A REAL TEST

Spring is the time of year when most Nature photographers begin to harken to the birds, and to look through handy trees for nests that might make good camera subjects. There are few pictures more appealing than those that show big-mouthed baby birds clamoring for food, and hard-working parents on the job with worms, insects and other edible items ready for deposit in those wide-open yellow beaks.

But bird pictures are not easy. Even a simple nest-and-eggs picture presents numerous difficulties. Birds do not build their nests with light, accessibility and convenience to photographers in mind.

Since Nature photographers must also be Nature lovers, they should bear in mind several "don'ts" in connection with nest-and-egg pictures. These include:

1. Don't monopolize the nest too long, otherwise the eggs will get cold and will not hatch.

2. Don't keep the eggs exposed to the hot sun too long—too much heat is as harmful as too little heat.

3. Don't disturb the nest or its surroundings—this might cause the parents to abandon the nest entirely.

4. Don't reveal the location of the nest to those who might

harm it. Birds like privacy, and there are both two-legged and four-legged nest robbers.

5. Don't remove foundations or sheltering branches so the next heavy rain will destroy the nest.

6. If the nest is on the ground, don't trample surrounding cover and leave the nest exposed to the first cat, dog, skunk or weasel that happens to come along, following your trail.

7. Don't take your picture at the cost of a bird's life. If you can't leave the nest in the same condition you found it, don't try for a picture.

BEACH PHOTOGRAPHY

The easiest bird nesting pictures we have ever taken are those of various beach birds—terns, skimmers, gulls and the like. After that come those that nest in colonies or rookeries—the herons, egrets, pelicans and cormorants.

In our area on the Florida coast, one of the first signs of spring are the small, trim least terns, which begin to arrive in February from points farther south where they found themselves when they felt the urge to seek their nesting ground.

At first only single individuals of these black-crowned, gray and white "sea swallows" are to be seen, fishing near causeways or along the beach. But as February fades into March, and March into April, their numbers increase. Finally, by May, those that are to remain have selected a fairly isolated point or lonely beach—or possibly an island if they can find one that has been overlooked by real estate developers.

On the bare sand, between the high tide mark and the place where beach vegetation begins, the terns scoop out little hollows. They may line the hollows with shell fragments, or they may not. Tern architecture varies. In the hollows two or three buff-colored eggs, with brown and purple splotches, are laid. They match their surroundings closely, especially if the sand is grayish from backwash, or if there are shell fragments scattered about. It is impossible to see them until one is almost on top of them.

This kind of nest photography is easy. There are no trees to climb, no intervening leaves or branches to dodge, no shadows to worry about. Too much light, rather than too little, is the problem here.

But after all, one sand hollow with a couple of eggs in it is just like hundreds of others on the beach. There is no use wasting film on many of them even though the photographer's enthusiasm is apt to run away with him.

The trick is to get a picture of the tern mother on her nest. But how to do that on the beach, where there is not a thing to hide behind? There is a way to do that—but the "hows" of it will have to wait until some other "Camera Trails" installment.

Wilderness Trips

Word comes from H. Frank Evans, who conducted Wilderness Trail Trips before the war called him into uniform, that he has returned to his hiking clothes and has worked out some itineraries for the 1946 season. Glacier National Park is the place selected this year. This is a program for those who like to vacation afoot in wild areas unchanged by time, save for the penetration of trails. Pack animals carry equipment and supplies between campsites, and everything except actual wearing apparel is furnished. When Frank wrote us, his separation from the Army was so recent that all details were not final. However, anyone interested may now obtain schedules, itineraries, costs and such from H. Frank Evans, Glacier Park, Montana.

Nature Photographs

After seven successful years, *Hobbies,* the magazine of the Buffalo Museum of Science, will hold its Eighth International Salon of Nature Photography from May 15 through June 11. Nature photographers interested in entering should write to Hobbies Salon of Nature Photography, Buffalo Museum of Science, Buffalo 11, New York, for an entry blank and full details. The latest day for receiving prints is May 12.

Geophysicists Meet

The American Geophysical Union will hold its twenty-seventh annual meeting in the Hall of Government, George Washington University, Washington, D. C., May 27 to 29. Information concerning the program may be secured from the office of the American Geophysical Union, 5241 Broad Branch Road, N. W., Washington 15, D. C.

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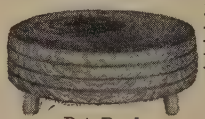

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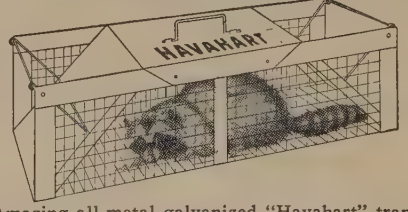

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ARTIFICES OF THE NEST BUILDER

(Continued from page 236)

cholla cactus is its favored homesite. But in a region so blessed with barbs and thorns it can afford to be versatile. This giant among American wrens often places the large, cylindrical grass house among the spears of Spanish bayonet, in the thorny tangles of cat's-claw or mesquite, and amidst the keen bristles of Joshua trees. The owner readily pops in or out at the tunnel doorway, but a hand thrust into the feather-lined interior suffers cruelly from the host-plant's spiny armament.

The safety offered by cliffs and tall trees was recognized by the birds long before cliff dwellings and tree houses were constructed by human hands. The osprey, a feathered fisherman of world-wide distribution, owes its extensive range in part to the inaccessible nesting sites that insure increase of its kind. Islands have similarly isolated the gulls, pelicans, petrels, shearwaters, penguins, puffins and allied hosts through the ages. Marshes and swamps have long provided haven for hunted homemakers, while that fraternity of carpenters, the woodpeckers and nuthatches, makes use of the forest's stout walls in its own singular way.

The floating platforms built by grebes are a superb utilization of the protective conditions of their aquatic habitat. Dead reeds, grasses, water weeds, mud, and other decaying vegetable matter, piled skilfully upon green stalks to give the structure minimum buoyancy, form low, off-shore nests of deceptive appearance. Attached loosely to the surrounding stems, they rise or fall with changing water levels. Being only soggy collections of old marsh growth, they are as little likely to attract attention as the "water witches" themselves. The pied-billed grebe may not even anchor its floating egg basket, but lets it drift at random about the cattail pond.

Situation of nest site is a prime factor in the locations sought by breeding bank swallows. And once they have found a bluff or bank to their liking they will confirm their troglodyte ownership by annual occupation. Kingfishers have taken a cue from them, and the vertical stream-cuts along its chosen creek are this feathered Waltonian's idea of a happy homestead. At the end of a narrow nest-tunnel, a tufted puffin's great, uncouth beak becomes a truly formidable weapon in defense of her subterranean, sea-island home.

Upon the bare prairie the burrowing owl was hard put to it to find a site suited to its particular needs. Whether or not this bird is entirely welcome is uncertain; but it continues to enjoy the prairie dog's and badger's underground hospitality—more than we would if a rattlesnake were our fellow lodger.

Situation claims first consideration from bird residents in Arizona's land of the giant cactus. There interior floor space is at a premium, and is made available chiefly by efforts of local craftsmen —the gilded flickers and gila woodpeckers. Their quarters, excavated in the fluted stems of the sahuaros, are in constant demand by pygmy, elf, and screech owls, ash-throated and crested flycatchers, Lucy warblers, martins and sparrow hawks. The western red-tailed hawk finds the spiny column of the great succulent an excellent substitute for streamside or forest tree, its huge green arms ample support for the bulky platform of interlaced twigs and creosote branches.

Investigation of housing projects and problems in a cactus community would certainly not lack for fascination. Nor would a study in home security made at the eyrie of the golden eagle, or of the prairie falcon in its high, precipitous, alpine nesting grounds want for rare observations. Yet we have seen enough to prove the wile, the ingenuity and the resourcefulness of many winged celebrities. To insure continued interest in the artifices with which a host of nest builders again will safeguard helpless nestlings, we need but go abroad into our summer land.

A LITTLE RED SCHOOL FOR ANIMALS

(Continued from page 241)

vigorous gnawing and tugging at the edge of the door before the animals learned the proper series of movements. In another experiment the first latch, after the chipmunk had learned to push it up and out of the way, was fastened by a string running to the lower edge of the box so that it could be pulled down and clear of the door but could not be pushed up. As usual this was followed by vigorous efforts to push the latch up, so vigorous at times the front end of the box was lifted three or four inches off the ground. After several trials in which the latch was finally pulled down and out of the way, this became the accepted way of getting into the box. In still another device a vertical disc had to be swung around until a large notch in its rim came over the hole into the box, thus allowing access to the food.

One time and another a considerable number of experiments were set up in which peanuts were tied to the ends of strings, and hung in such fashion that the only way to get at them readily was to pull the strings. In the simplest of these experiments the strings were tied to a horizontal pole. If the peanuts were any where close to the ground the animals would first try to reach them by jumping straight up for them. It was surprising how high some of the mantled ground squirrels could jump. But presently the animals would crawl out on the pole until they came to the string and pull it up, hand over hand, until the peanut, empty shell, or even a piece of wood or paper tied on the end, came within reach. The chipmunks were much more adept at this hand over hand pulling than the ground squirrels. When a stout string was substituted for the pole it no longer offered good footing, and the contortions of some of the animals in their efforts to get out far enough to reach the peanut laden strings became more than a little amusing. At one camp two of the ground squirrels started out along the horizontal string and lost their balance. Instead of dropping to the ground they hung on beneath the string and went out, hand over hand, until they could reach the peanut strings and pull the nuts up to them. Then they usually let go of the horizontal string, only to be brought to a sudden stop when they came to the end of the vertical string. Usually they held fast to the peanut, and hung whirling in the air, gnawing at the string until it parted and they dropped to the ground.

At another camp one of the ground squirrels persisted in cutting through the horizontal string, thus bringing all the nuts to the ground at once. I soon replaced the string with a wire.

From those simple beginnings, peanuts were hung in increasingly difficult situations. These sometimes involved going to points several feet away from the peanuts in order to get at the strings, so that the peanuts could be pulled over the horizontal string and thus fall to the ground. Some of these situations became quite complex.

Ordinarily only a few of the chipmunks or mantled ground squirrels around camp would enter into these experiments. Most of them would ignore the setup, or, at least, make a few faint-hearted attempts and then give up and go about some easier way of getting food. A few would become almost unbelievably persistent. At times it became rather nerve-wracking to watch them. Failure would follow failure. This, that, and another way would be tried to get at the food. Finally some way would lead to success, and in a short time it would replace the unsuccessful efforts. There were bright ones and dull ones; some learned quickly and others very slowly.

The marking that was necessary to distinguish the individuals made it easier to observe certain other features of their behavior. Occasionally camp was within the territory of an individual that would try to defend it against trespass by others. But the lure of food brought so many individuals into camp that this defense was difficult. Another type of behavior was even more apparent, although working out the details took close observation. This was the hierarchy of bosses and underdogs that presently became established or revealed. But this is another story.

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THE ICE CLOUDS

(Continued from page 242)

rarely catch their structure for they have such great transparency. You will not be able to see the cirrus during day, or you might only see its skeleton structure because the sun shines directly through. But wait until sundown when the light shines up at them, indirectly, and the whole heaven will spring into a symphony of reflected splendor. Or let the sun and moon shine through cirrostratus, and, like shining a flashlight through a cake of ice or a Christmas tree bulb through "angel hair" shredded glass festooning, a beautiful halo will appear. When there are two halos, the light is shining through two strata of ice clouds.

Much like cirrus is the veil cloud often accompanying the cumulonimbus or thunderhead (4). Actually this is only a mist of snow that the turbulence has "spit out." Such glaciating is commonly seen in any turbulent cumulus type cloud, but the full-grown thunderhead with anvil top often reaches icy heights, and then the anvil streamer becomes true cirroform. This veil will stream out into the direction of the storm path and show which way the thunderhead is traveling.

From the earth, high mare's tail streamers appear to be motionless, but, considering their height, this is not remarkable. A plane at such altitude (if there were a plane large enough to be seen at cirrus heights) would not appear to move either, although it would probably be speeding about 400 m.p.h. in such thin air! Actually the winds at cirrus heights are terrific, as may be seen by the wind-torn shreds that sometimes are fifty miles long. The winds aloft at 30,000 feet are usually global "prevailing winds," and can be depended upon for very long flights. You may sometimes notice that cirrus is traveling at an exactly opposite direction from low altitude clouds. Today's weather maps for flyers are made for many altitudes so that they may follow the best wind patterns for their particular direction of flight. Tomorrow's transports may be flown through fields of ice clouds, but, so far, few planes have looked down upon those artistocrats of cloud-land, the cirrocumulus, cirrostratus and cirrus.

BERKSHIRE GARDEN CENTER

(Continued from page 260)

Society, in 1942, awarded its gold medal to the Center, further proof, if needed, that the young garden center had arrived.

Victory gardening was continued with vigor and enthusiasm in 1943 and 1944. A new feature was a demonstration storeroom. Meanwhile flowers, while somewhat subordinated, had not been neglected, and the development of the "master plan" for the grounds included a rock garden, perennial borders, potted plants on the terrace, and a collection of clematis.

With the war's end, interest swung back towards gardening for beauty. The 1945 program included such features as dwarf apple trees, small fruits, grape vines and blueberries, ground covers, a terraced herb garden, a sun-heated pit, herb display room, a compost pile and pit, and a named display of peonies. War needs were not neglected, however, and there was a lecture and demonstration on "Canning in Tins for Shipment to the Armed Forces." The Dutch elm disease, scourge of New England's finest shade tree, came in for considerable attention. Iris and chrysanthemum collections were also featured.

Mrs. William Felton Barrett, President, concluded her 1945 report by saying: "As a center of horticultural interest and information we have proven ourselves, and as a center of goodwill and friendliness." Director Simpson aptly added: "The peace horizon is bright for a tremendous interest in home gardening."

Dawn of our first peaceful year finds the Berkshire Garden Center thriving and with a membership of 800. A regular membership is only $1 a year with patron memberships running up to $100, or more. Any member living within driving distance of the Center may request and receive a personal visit from the Director by paying mileage and a nominal fee. Many members and clubs also ask questions by mail.

Having, in a brief dozen years, proved itself to be such a worthwhile garden service institution, the Berkshire Garden Center may be pardoned if it is rather proud of its record. As an example for other communities it offers much in the way of ideas and inspiration. Even in crowded urban areas, many of the service and educational features of this center can be provided. Dirt gardeners of all classes should welcome the opportunity to belong to and enjoy the benefits of such an organization.

THE DISCOVERED PLANETS

(Continued from page 269)

magnification. Like Uranus it was observed and mistaken for a star a number of times before its discovery. Neptune has only one satellite, sometimes called Triton, which was discovered within a month of the discovery of the planet. It moves backward in its orbit. It is a faint object of 14th magnitude, but actually is even larger than our own moon.

Pluto, the third planet to be discovered, was found on photographic plates taken at the Lowell Observatory in a systematic search for a transneptunian planet. Percival Lowell, founder of the Lowell Observatory, had made mathematical calculations that indicated the possible existence of a small planet in the constellation Gemini, where the planet actually was discovered on January 23, 1930, by C. W. Tombaugh, an assistant at the Lowell Observatory. It appeared on a photographic plate as a very faint object moving the amount required in the prediction. The small object was observed for two months at the Lowell Observatory before the discovery was announced. It was found by examination of old plates taken at different observatories as far back as 1914, and this was a great advantage in the determination of its orbit. Pluto has moved, since the date of its discovery, from Gemini into Cancer. Its period of revolution around the sun is 248 years and its distance from the sun is 39½ times the distance of the earth from the sun, or about 3,675,000,000 miles. Its orbit has such a high eccentricity that its distance from the sun varies by as much as 1,830,000,000 miles and at perihelion it comes 49,000,000 miles inside Neptune's orbit. The relative positions of the two orbits are such that they cannot intersect, however, and the two planets cannot approach closer than 240,000,000 miles. Pluto can be seen only in the most powerful telescopes as a faint star—without any perceptible disk—of 15th magnitude. The best estimates of its mass indicate that it is about equal to that of our own planet, and that Pluto resembles the terrestrial planets rather than those nearest to it. The great eccentricity of its orbit and its high inclination, greater even than that of Mercury, is remarkable. In this respect it resembles the asteroids, though in size it is, indeed, one of the major planets.

In May Mercury will be poorly placed for observation. It will be in superior conjunction with the sun on May 31. Venus is now high above the western horizon at sunset. Mars is in the western evening sky in Cancer, and sets about an hour after midnight. Its brightness is that of a star of 1st magnitude. Jupiter is in Virgo and visible most of the night. Saturn may be seen in the western sky in Gemini at sunset and sets about midnight.

There will be a partial eclipse of the sun on May 30, magnitude of greatest eclipse 89 hundredths of the sun's diameter, which will be visible only in the South Pacific and the southwestern part of South America.

Forest Waters Popular

During 1944, according to the U. S. Forest Service, 1,450,000 anglers spent a total of 2,210,000 days in the 152 National Forests, throwing their lines into fishing streams and lakes. Indications are that this figure was surpassed in 1945, and 1946 is expected to see a new record.

Acquire Park Lands

Within the boundaries of our National Parks and Monuments there still remain more than 600,000 acres of privately-owned or state-owned lands. These areas should be acquired by the Federal Government in the interests of the proper administration of our great national reservations. It is estimated that it would take about $20,000,000 to complete the purchase, yet only $350,000 is included in the Interior Department appropriation bill for this purpose. Conservationists are urged to go on record with their congressmen in favor of doing a job that has too long remained undone.

Fish and Wildlife Briefs

News releases from the United States Fish and Wildlife Service are many, and space does not permit publication of each release in its entirety. Following are some of the high lights of recent information.

The trumpeter swan, making progress in its battle against extinction, has increased in numbers in the past ten years to a total of at least 301 birds, exclusive of those in Canadian colonies.

A total of 1233 permits for the importation of 24,305 live wild birds and 16,612 other animals was issued during the fiscal year 1945. These importations included many pets and mascots brought back to this country by returning service personnel.

Sales of the one-dollar duck stamp, required by every hunter of migratory waterfowl more than 16 years of age, totalled 1,540,468 during the period from July 1 to December 31, 1945. This is a record total, and an increase of 257,002 over 1944.

Fresh-water anglers purchased 8,280,232 fishing licenses for a total of $10,580,311 during the fiscal year ending June 30, 1945, according to reports from the 48 States. This was an increase of 449,755 over 1944. California had the most anglers, Minnesota was second and Michigan third.

Hunting licenses for the fiscal year ending June 30, 1945, soared upward to 8,190,901, an increase of 685,643 over the previous year. Revenue from these sales totalled $15,512,252. Pennsylvania led in revenue from licenses, with Michigan second and South Dakota third.

The decline in the waterfowl populations of the Atlantic coast became apparent a few years ago and is still continuing, in some areas to an alarming degree. Preliminary reports from observers taking the annual January inventory along this coast indicate a disturbing scarcity of ducks.

More waterfowl refuges are vitally needed in the southern states if birds and gunners are to realize the full benefit of improvements already effected in the northern breeding grounds of ducks and geese. Dr. Ira N. Gabrielson points out that the birds must run the gauntlet of a million and one-half hunters on their southern flights and must have some places along the routes to find respite from the hunter's guns, and must also have suitable places to spend the winter months.

Big game animals have been increasing during recent years at a more rapid rate than the human population, although the present ratio of such large game to people is only about one to nineteen. Big game animals, figures show, totalled 7,148,422 in 1943. Pennsylvania has the largest number. Kansas has none. Deer greatly outnumber all others, comprising 89 percent of all the large game in the United States.

Arboretum Pictures

Anouncement that the directors of the University of Washington Arboretum Foundation have authorized $150 in prize awards for a 1946 camera competition is made by Middleton M. Chism, president of the Foundation. The awards will be made for the best pictures in monochrome or color portraying details of the 267-acre State Arboretum in Seattle. The contest is open to all, and the resulting pictures will be used to publicize locally and nationally the attractions of this reservation. Entry blanks for the contest, which closes August 15, 1946, may be obtained from the University of Washington Arboretum Foundation, 516 Medical Arts Building, Seattle 1, Washington.

Fellows Elected

In recognition of their distinction in scientific work, seven men recently have been elected Fellows of the California Academy of Sciences, one of the oldest natural science institutions in the United States. The new Fellows are: Arthur Cleveland Bent, Taunton, Massachusetts; Dr. Thomas H. Kearney, U. S. Bureau of Plant Industry, retired; Professor Herbert L. Mason, University of California; Professor George E. MacGintie, California Institute of Technology; Dean E. L. Packard, Oregon State College; Professor William T. Shaw, Fresno State College, and Professor George D. Shafer, Stanford University.

Bulletins Received

"Increasing Valley Quail in California," by John T. Emlen, Jr., and Ben Gladding. Bulletin 695, November, 1945, University of California, Berkeley, California.

"Woods and Trees: Philosophical Implications of Some Facts of Science", by Frederick H. Krecker. Publication 3788 of the Smithsonian Institution. U. S. Government Printing Office, Washington, D. C.

Classified Advertising

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Under the Microscope

By JULIAN D. CORRINGTON

THE PHOTOMICROGRAPHS FROM SLIDES COURTESY OF WARD'S NATURAL SCIENCE ESTABLISHMENT

THE DICOT STEM

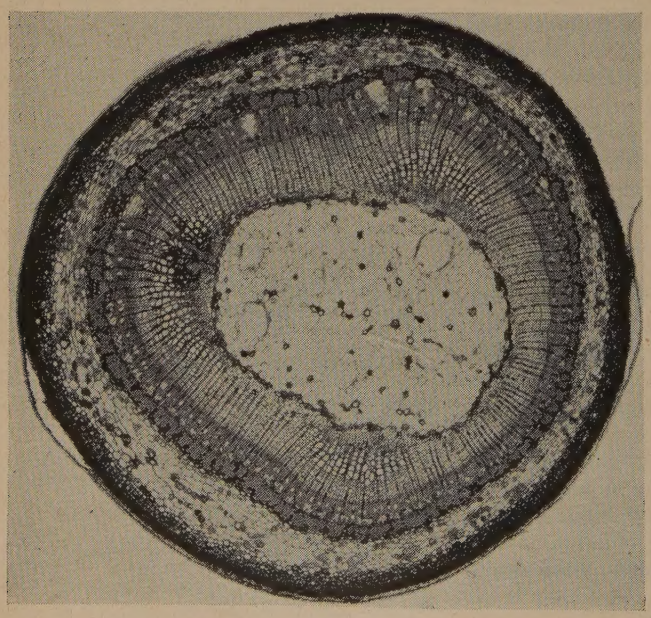
THE microscopic anatomy of the monocot stem, with definitions of kinds of plants and of stems in general, formed the subject of our main article in the March number. In order to avoid needless repetition, the reader is asked to refer back to that issue if unfamiliar words are encountered in the present explanation.

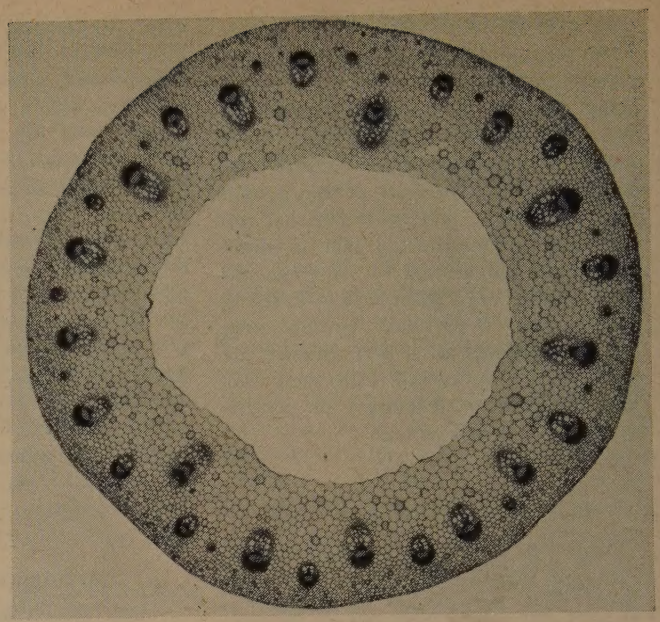
The stems of dicots may be classed as herbaceous or woody, although there are many borderline cases. The sunflower, for example, is herbaceous at first, with soft and non-woody tissues, but acquires a certain amount of wood as it matures. The majority of plants with herbaceous stems are annuals or biennials, but there are many herbaceous perennials too, and cases where the plant may be either annual, biennial, or perennial, depending on such factors as length of day, length of growing season, and temperature. Trees and shrubs are always woody perennials, and they may live for as many as ten years before first producing flowers, fruits, and seeds.

To understand the histology of the dicot stem, it is essential to begin with the embryo plant and to recall that the cells of the stem primordium are all alike in their visible appearance, and constitute meristem. That these cells are not all alike in their hereditary constitution soon becomes evident, in that they begin to differentiate into the formed tissues and organs of the later stem. Some of the meristem remains in the form of procambial strands, running lengthwise, and these cells differentiate into the xylem, phloem, and other tissues of the vascular bundles, always in dicots with a residuum of meristematic cells that remain unchanged and constitute the vascular cambium.

Instead of being scattered in a diffuse manner throughout all the parenchyma of the stem, as in monocots, the vascular bundles of the dicot stem are arranged in a more or less regular ring, with discontinuous cambium (open ring) in herbs

One-year-old basswood stem, woody type, 70X.





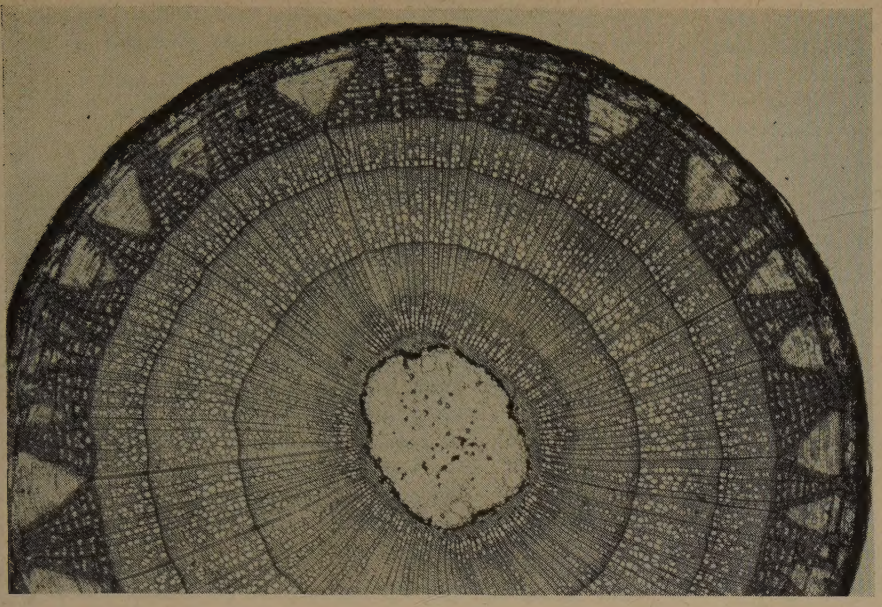
Cross section of buttercup stem, herbaceous type, 40X.

and some young woody stems, continuous cambium (closed ring) in certain older woody stems. The herbaceous stem is the simpler of the two, and hence makes the best type with which to begin this study. The following description will refer to our photomicrograph of the mature buttercup stem.

The outermost layer is a single line of cells, the epidermis. Beneath this comes the cortex, then the zone of vascular bundles. Each of these bundles is similar to those previously described for the monocot, corn, except that the cambium does not all transform into xylem and phloem; a central row of cambium cells remains undifferentiated, such a bundle being classed as "open." The large holes seen in each bundle are the vessels of the xylem, the dense and black material toward the outside is the phloem. Cambium that remains between these two, within a bundle, is termed vascular (vessel) or fascicular (bundle) cambium. Extending radially between bundles are pith rays, not particularly distinct as any definite structure in the buttercup section. The central part is hollow, as in many mature herbaceous stems; it was filled at an earlier age by large parenchyma cells, the pith.

The woody dicot stem begins with meristems and goes through a stage similar to that of herbs. In the illustration of the one-year-old basswood (linden) stem, the pith occupies the center, bounded outwardly by the central cylinder of vascular tissues, the stele (pronounced steely). Through this runs a large number of pith rays, also called medullary rays, for the horizontal transportation of water and of materials in solution. The inner and lighter colored ring of tissues, with prominent vessels, is the spring wood; beyond this a narrower and darker zone, the summer wood, both rings making up the xylem; then comes the cambium, and lastly the phloem, bounded outwardly by the pericycle. Beyond the stele lies the cortex, with the outermost epidermis seen peeled off in places.

In the three-year-old basswood stem, the three light-colored annual rings of wood are evident. Close inspection will show some rays that do not extend all the way outward from the pith, but begin in the stele. The primary pith rays diverge as the stem grows in girth and would soon be too far apart for proper functioning; the interfascicular cambium that develops between vascular bundles and makes the cambium a complete ring, forms vascular rays to supplement the work of the pith rays. That part of a vascular ray lying in the xylem is generally termed a xylem ray or wood ray; that part in the phloem is a phloem ray. They increase with age, that is, with the expanding girth of the stem, and run only a short distance vertically; the



Three-year-old basswood stem, 45X.

pith rays, on the other hand, do not increase, and extend the full length of an internode — one season's vertical growth.

Of the three main divisions of a woody stem: bark, wood, and pith, most of the bark is sloughed off and replaced from within, growing only gradually in thickness with increased age, while the pith, although extending throughout the entire trunk, does not grow in diameter at all. Hence nearly all of the size increase attending growth is found in the wood. Renewed activity in the spring is accompanied by a rapid formation of new xylem on the inner face of the cambium, followed by a slower addition in the early summer. In those trees termed ring-porous, as basswood, the broader zone of lighter colored wood with prominent vessels is the spring wood, while the narrower, more compact, less porous, and often darker colored area is the summer wood, terminated by a dark line marking the resting period of fall and winter. Oak, ash, elm, and hickory are other ring-porous woods. In the sycamore, beech, birch, tulip tree, and sweet gum, the woody elements are distributed more or less uniformly through both spring and summer woods and there is no line of demarcation between these seasons; such trees are called diffuse-porous.

Only the outer annual rings function in the transportation of water, the number of such varying in different species. Eventually water and food begin to disappear from the inner rings, living protoplasm dies and disintegrates, the cell walls become heavily lignified, and the cell spaces infiltrated with various gums, resins, and tannins, often giving this inner zone a darker color, in shades of reds or browns. The outer, living rings constitute the sapwood, while the dead inner region is the heart-wood. The latter is usually of greater commercial value, being harder and more durable. A large amount of heartwood characterizes oak, ash, and walnut, while a small amount occurs in tulip and willow.

On the outer face of the cambium, new phloem is added annually, but these increments are not so evident or as easily seen or counted as those of the wood. Popularly, all tissues outside the cambium are a part of the bark; technically, only those outside the pericycle. In the spring, when the cambium cells are actively dividing, all outer tissues can be peeled away in one piece, termed the bark. This takes the phloem with it, preventing any food materials going to the root system, hence girdling a tree is one of the surest means of killing it, since the roots will slowly starve and die, after which the shoots cannot receive water, and death of the entire tree then follows.

The phloem cells make cork cambiums as a tree matures, composed of meristematic cells that form corky layers on their outer faces. After the epidermis, cortex, pericycle, and most of the primary or older phloem has died and sloughed off, the corky layers, now termed periderm, make up the bark of older trees. This may weather and peel off in thin sheets, as in the sycamore, or may remain as a thick layer with characteristic deep grooves, as in oak, each species having its own distinctive bark. Thus the term bark does not apply to the same plant tissues in all usages or at different ages.

Thus far the appearance of the various parts as seen in a cross section have been described as rings, but the longitudinal extent must be kept in mind in thinking of the functioning of a stem, and the notion that its components are not rings but cylinders. The first annual ring of wood in a tall tree is the innermost, next to the pith. It is a cylinder that extends from the base of the stem to that point

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representing the height of the tree when it was one year old. The next cylinder, counting toward the bark, runs from the base to a point representing the height of the tree at two years, and so on, the outermost cylinder of wood running all the way from the base to the present apex. In the same manner, the innermost cylinder of phloem is the youngest and extends from the base to the top, the outermost cylinder of phloem, the oldest, if still present, passes from the base to the extent of height of the first year. Furthermore, all of these cylinders extend out into the branches and twigs, according to their age, and down into the roots, the most distant twigs and deepest root tips representing the present year's addition to the entire tree system.

Later chapters in this botanical story will describe methods of preparing slides for stem study, the microscopy of commercial timber, and historical facts that have been determined through an exhaustive study of annual rings.

CARTOON CONTEST

A large number of entries was received in the contest appearing in the February issue wherein two cartoons were reproduced, showing Dick Tracy and Donald Duck in the role of microscopist. Readers were asked to judge which of these two favorite characters was the more experienced with the microscope and nearly all of the answers awarded the palm to Donald. The winner, who received a copy of Dr. Corrington's *Working With the Microscope,* was Harley P. Brown, of the Department of Zoology, University of Idaho, Moscow, Idaho, for the following letter:

"I enjoy your column UNDER THE MICROSCOPE in Nature Magazine regularly. Your comic-strip quiz in the February issue, however, pleases me particularly. I think I can understand Donald Duck's feelings with a brotherly intensity.

"Without wishing to cast aspersions upon the eminent detective Tracy's technique, I shudder at that squint of the eye. Then too, he is accomplishing an amazing optical feat if he is seeing anything through the microscope with his eye practically on a horizontal plane with the ocular and not above it enough to mention. I suppose his hat reduces glare and distracting objects, but I should prefer to remove my own. And if those things in the lower left represent Dick's fingers holding the tube, I suppose it requires his steady nerves to keep it firm and steady. After all, a microscope with such a pin-point connection between body tube and adjustment head probably needs some such support.

"There might be suggestions for improving Donald's technique, also, regarding such matters as better adjustment of the mirror, not tilting the microscope with a liquid mount, keeping a hand or so free for the manipulation of adjustment and slide, etc. . . . but, on the whole, I should consider Donald a more practical and efficient microscopist than our esteemed friend, Dick . . . with due apologies to the latter, of course. At the very least, Donald could see through the instrument, whereas I cannot perceive how Dick could do so."

Runner-up was Raymond Gregg, Naturalist, Rocky Mountain National Park, Estes Park, Colorado, who wrote:

"Disregarding the amazing construction of their respective instruments, Donald Duck earns the 'Oscar' for his 'bird's-eye' approach.

"Unless Tracy's open eye is set at an oblique elevation of some 45 degrees (which in itself would be a new high in arched eyebrows), or his instrument is diversified by inclusion of a built-in periscopic effect, he is more likely to see his next nemesis approaching than the supposed object of his astute gaze.

"Police microscopy doubtless is more versatile art than that of the laboratory, but the use of a microscope for examination of objects as relatively gross as set screws, however fine the instrument from which extracted, conforms slightly less to orthodoxy than the fearsome critter which sent Donald scurrying to the arsenal for defense."

Third place was taken by Harry William Dengler, Extension Forester, Maryland Extension Service, College Park, Maryland, who decorated his sheet with an artistic rendering of pine cones and put his opinion in verse:

TWIXT DONALD AND DICK

The best microscopist,
  Whom, Donald or Dick?
The answer to this,
  Is really no trick.
For Tracy, our hero,
  Super sleuth tried and true,
That squinted left eye'll soon
  Be both sore and blue.
And that hand on the scope
  Most outrageous to perceive.
That Tracy should stoop so,
  Is hard to believe.
Now 'twixt Tracy and Donald,
  They both, I admire,
But for my microscopist,
  'Tis Donald I'd hire.

Our thanks and appreciation to these gentlemen, and to all the others, from Raymond Sparks, age 11, to business and professional men and women, who made the contest a lively and interesting one.

A. S. A. M.

High quality characterizes the articles appearing in Number 4, Volume II, of the *Bulletin* of the American Society of Amateur Microscopists, recently mailed to members. Beginning with a portrait and tribute to the late Dr. Simon Henry Gage, first President of the Society, the next and leading article is *The Study of Human Blood Cells,* by F. John Howe, pathologist of the St. Cross Hospital, Rugby, England. This is Mr. Howe's second contribution and is a long and carefully assembled account of the history of this work, its nature, a full description of the blood and its corpuscles, their development, and all of the standard techniques for examination and study of the blood.

Ernest J. Roscoe publishes his first check-list of the protozoa of Utah, Helen Farra describes mold counting in the canning industry, Albert Capista explains urinalysis as the first of his contributions on medical laboratory technology, Nina Starr and Irwin Weisbrot show how to secure and process sedimentation mounts of protozoa, and Margaret Breitling discusses insect mouth parts.

One of the most unique and interesting articles yet seen in this journal is entitled *Worth Twice its Weight in Gold,* by John H. Small, of the Spencer Lens Company, Buffalo, New York. His illustration, which is also reproduced as the cover design for this issue, shows a longitudinal section through the lower portion of a 2 mm. N.A. 1.40 apochromatic objective. The article describes how such a fine objective is designed and manufactured, how it is used, and why it is "worth twice its weight in gold."

Still another unusual subject is that of Tte. Arturo Borges Badell, Jefe del Bureau de Identificacion, Policia Nacional, Santiago de Cuba. He shows how to construct, in the home workshop, an improved montage for bullet-comparison photomicrography, a subject dear to the heart of those interested in scientific crime detection. Harold Klinger explains the design of an apparatus to stimulate protozoa with an electric current, while Will Rogers describes a most ingenious attachment for ringing slides that may be used by anyone owning a phonograph.

Those interested in joining the Society and receiving a copy of this and subsequent *Bulletins* should write to Herman W. Fowler, Secretary, 2729 Connecticut Ave., Pittsburgh 16, Pa. The dues, including subscription to the *Bulletin,* are only $1.00 per year; combination subscriptions to *Nature Magazine* and the *Bulletin* of the A.S.A.M., $3.50. This combination effects a saving of fifty cents. Both types of subscription should be addressed to Mr. Fowler.